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ASSISTANT SECRETARY OF DEFENSE-PUBLIC AFFAIRS

Training Center for Retarded Gets Subcontract for Army Field Heater Kit Work

An employment training center for the mentally retarded has become a defense subcontractor through the efforts of the U.S. Army Tank-Automotive Center (ATAC), Warren, Mich.

New Horizons of Oakland County, Inc., located in Royal Oak, Mich., has been selected to package small components for Park Industries of Melvindale, Mich., as part of the firm's work on a $100,000 contract to produce field heater kits for ATAC.

A nationally recognized training institution for the mentally retarded, New Horizons contacted ATAC early this year for assistance in obtaining work for its trainees. All small business contracts let by ATAC after that time were screened in search of work which could be done at New Horizons.

Park Industries became interested in the project and worked out an agreement with New Horizons for packaging work as part of its ATAC contract.

New Horizons is a community organization devoted to the creation and operation of work-training centers for the mentally retarded of Oakland County, Mich.

During the 20 months it has been in operation, New Horizons has handled over $25,000 in contracts from business and industry. So far, 18 trainees have been placed in full-time employment with private companies, using the skills they learned at New Horizons.

University of Illinois Site for Army Engineer Construction Research Lab

The University of Illinois has been selected as the site of a new construction engineering research laboratory to be operated by the Army Corps of Engineers. Selection of Illinois was made after study of proposals made by 20 engineering schools and universities in response to an invitation by the Corps of Engineers.

The new facility will be constructed by the University of Illinois and leased to the Corps of Engineers which will operate it. The laboratory is expected to begin operations in mid-1968. Its annual budget will be about $3.5 million.

Planning for the establishment of the laboratory began a year ago when it was determined that construction research requirements exceeded capabilities of the Corps' existing laboratories. Rapid advances in technology and more stringent demands for performance of facilities required for construction present problems requiring increased construction research.

Broad areas of research to be carried out by the new laboratory include studying ways to speed the application of the latest construction technology, developing more progressive construction policies and procedures, and seeking methods for developing and carrying out long-range construction research programs. Investigations will embrace such diverse areas of study as testing techniques, environmental control, hardened power plant construction, and research in enhancing the esthetic values of structures and preserving natural beauty with man-made design.

A committee of specialists from the Building Research Advisory Board, under a contract with the National Academy of Sciences, is assisting the Corps in planning its long-range construction research program.

The Christmas art on the cover of this issue is by John E. Fagan, Graphics and Presentation Branch, Office of the Secretary of Defense.

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BULLETIN

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The purpose of the *Bulletin* is to serve as a means of communication between the Department of Defense (DOD) and its authorized agencies and defense contractors and other business interests. It will serve as a guide to industry concerning official policies, programs and projects, and will seek to stimulate thought by members of the defense-industry team in solving the problems that may arise in fulfilling the requirements of the DOD.

Material in the *Bulletin* is selected to supply pertinent unclassified data of interest to the business community. Suggestions from industry representatives for topics to be covered in future issues should be forwarded to the Business & Labor Division.

The *Bulletin* is distributed without charge each month to representatives of industry and to agencies of the Department of Defense, Army, Navy and Air Force. Requests for copies should be addressed to the Business & Labor Division, OASD(PA), Room 2E813, The Pentagon, Washington, D.C. 20301, telephone, OXford 5-2709.

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Management Systems for Package Procurement

by

Lt. Gen. W. A. Davis, USAF

The Total Package Concept (TPC) is likely to be applied to a large number of select programs in the years ahead and will have certain impacts on present Air Force and other Government agency management systems. Thus TPC needs to be clearly understood not only by military managers but throughout industry.

TPC, as conceived by the Air Force, envisions that all anticipated development, production, and as much support of a system as is feasible throughout its anticipated life, is to be procured as one total package and incorporated into one contract containing price and performance commitments at the outset of the acquisition phase of a system procurement.

Stated simply, TPC looks at the procurement process in the same way that the Air Force has long looked at a given major system—as a total package rather than as a series of "black boxes" or as a sequence of relatively independent stages. In fact, our ability to apply TPC stems from the fact that we have been managing systems programs as total systems for many years.

TPC requires at least two basic conditions:

- It must be possible to define the performance requirements for a given system in detail and with a high degree of accuracy.
- The major technology needed must be in hand.

TPC calls for a straightforward job of engineering development. If the system cannot be defined with a high degree of detailed accuracy, a sufficiently definitized contract for TPC cannot be developed. Moreover, if the technology is not substantially in hand, the risk is simply too great to allow for a fixed price. If a fixed price is not obtainable, TPC cannot be applied and, as a result, there is no total package procurement.

The C–5A, which met the criteria, was the first procurement under TPC. It has been estimated that as much as 90 percent of the program for the first seven years is being bought under a single binding fixed-price incentive contract. The contract covers all the engineering development and production of the system including support such as ground equipment, spares, training devices and contractor technical support. A very important fact is that the single contract contains price, performance and schedule commitments for the whole system from the start of acquisition.

Under the stage-by-stage, or sequential, method of procurement we generally start by buying only about 20 to 25 percent of a program—the development portion. Then follow-on production contracts are awarded for training, spares, etc. This approach has been dictated by a number of large systems programs in which detailed definition was not possible in the early stages, where technology was not in hand, and where the risk was simply too great.

Under the sequential approach there is the hazard of so-called "iceberg procurement." Simply stated, when we initially contract for the development program, we are buying only the top of the iceberg. Then we may find that we are in a sole-source position with the development contractor for follow-on, or the underwater portion of the iceberg.

Lt. Gen. W. A. Davis, USAF, is Vice Commander of the Air Force Systems Command, Andrews AFB, Washington, D. C. He has held prior assignments in AFSC as Commander, Aeronautical Systems Div., 1961–1962; and as Commander, Ballistic Systems Div., 1962–1964.

This means that there is real competition for a relatively small portion of the program. In the case of some of our past programs this had tended to prompt unrealistic estimates during the early competition. There is ample evidence that, during some development competitions, contractors have tended to overstate estimates for performance and understate probable costs. The estimates for final production systems have also tended to be optimistic. Estimates of this kind have generally been budgetary estimates that are not contractually binding.

The bulk of these optimistic estimates have been due to a lack of adequate definition or the right kind of data, but some of the optimism has been the product of a deliberate effort to "buy-in."

One point should be made very clear. The sequential method has worked well in the past and, of necessity, will be applied to programs in the future. In some cases, it is the only avenue open to us. Careful negotiation, competent exercise of management control, and constant vigil can largely overcome the hazards involved.

TPC represents another and a very effective way to overcome the hazards—where it can be applied. It is a very good approach to reduce program cost and schedule overruns. The following measures are applied under TPC:

- Competition is broadened to cover the entire system package and not just the initial stages.
- Discipline in the areas of definition and estimating are greatly tightened during competition.
- A fixed price is established during competition which becomes binding on the selected contractor.

These measures could lead to some real savings in programs where they can be applied. They should definitely result in fewer surprises in terms of overruns.

It is true that TPC provides a solution to the problems of iceberg procurement. However, TPC also raises some problems, namely:

- The problem of "disengagement." This term simply means the degree to which the military divorces itself from detailed management.
- The problem of inhibited technological innovation.

The problem of disengagement is especially thorny. We recognized this when we embraced incentive contracting many years ago. The problem becomes more acute under TPC. On the one side, under TPC contractors must have essentially a free hand. On the other side, the military cannot abrogate completely its responsibilities. It is true that a contractor may go broke if he fails to meet his downstream contractual commitments. This would be no consolation to the military if the system ordered simply did not meet the established requirements. This could have a grave impact on national security.

So we cannot say to a contractor, "Well, here is the contract. Come back to us in five years or so with the product, and good luck." Instead, we will be looking over the contractor's shoulder and will insist on ample visibility so that we can step in if necessary. This is the keystone to a management system for total package procurement—the ability to step in if needed instead of day-to-day participation in detailed management.

There has been some misunderstanding on this point. Disengagement does not mean that the military or Government agency gives up control. It simply means that we do not get involved in detailed management unless we have to. We will monitor very closely, we will step in if we have to, and we will retain the right of control.

Therefore, the problem of disengagement imposes some questions that we must continually ask ourselves:

- On a given program, how much control do we turn over to the contractor?
- How closely do we monitor?
- At what point do we step in? What are the consequences? What penalties are involved for industry or for the Government?
- What price do we pay if we do not step in at a given point?

Where TPC is concerned, I think everyone would agree that the military should not exercise control unless that action is required to achieve military requirements and objectives. The Air Force intends to establish discipline in our management systems to insure that this basic rule is followed. To achieve this end and to make sure that all our approaches are integrated, a Management Systems Control Board has been organized at Air Force Systems Command (AFSC) headquarters under the chairmanship of the Vice Commander. The primary role of the board is to insure that a disciplined method is established for the evolution and systematic development of AFSC management systems and policy.

This applies especially to those procedures that cut across functional lines and impact on the contractor's internal management activities. A specific objective of the board is "to address the questions of disengagement and visibility."

The other problem raised by TPC, as previously stated, is that of inhibited technological innovation. When a system is bought at a fixed price under TPC, there is a tendency to freeze technology at the current state of the art. In such a situation, downstream we get essentially what was bought years earlier, probably incorporating very few, if any, significant technological advances achieved after the original contract was signed. The contractor is not motivated to include, or aggressively pursue, technological innovations that would improve the system if such an improvement would result in increased costs.

This is a significant problem and there are no short and simple solutions. It is true that TPC will inhibit change for the sake of change. It also insures that changes, which are designed simply to bring the system up to the point where the contractor promised it would be in the first place, are within the scope of the contract. This does not prevent the customer from accepting changes that would greatly improve the system. The fact remains that technological innovation, which might greatly enhance the value of a given system beyond its original specifications, is inhibited to some extent.

We will need to give a great deal more attention to this problem and ways to overcome it. We are working in this direction and eventually should find the answer for which we are looking.

Clearly, TPC has a number of specific impacts for both military and industry management:

- The military must be able to define more precisely what it wants at the outset.
- Industry must be able to define more completely what it will deliver for a price.
- Industry must be concerned from the start with design for economical production, value engineering during design, reliability, and simplicity of maintenance—to design accurately the first time. This is a task for which industry is uniquely qualified just as the military is uniquely qualified to define operational requirement.
- More of the detailed manage-

Artist's concept of the AGM-69A Short Range Attack Missile (SRAM). The SRAM will be acquired under the total package concept.

ment decisions are shifted to industry. Industry managers have the burden of getting the necessary quality at the lowest possible cost. This means that industry, rather than the military or Government agency involved, will be increasingly concerned with the need to obtain supplies and services from the most efficient sources.

- Both military and industry management will need to find imaginative new ways to encourage and stimulate technological innovation.

These are some of the key implications of TPC for management. There might be a tendency to think that the application of TPC calls for some radical changes in our management methods. This is not really the case, although some changes are called for and are being made.

The fact is that the concepts of total system management and of total package procurement are largely compatible. A prerequisite for TPC is the ability to manage systems as total systems. A prime requisite to good system management is flexibility of the management system. Under the formal Air Force management disciplines, we can manage a total system in-house in great detail, or we can manage in relative detail "over-the-shoulder" of major contractor, or we can disengage from detailed management at any point and to the degree that seems appropriate.

The reason this is not always readily appreciated is that some people tend to look at all of our formal management documents as hard-and-fast procedures. Actually, there is nothing static about them. They are guidelines that may be used in a number of different ways.

While there may be a number of refinements to formal Air Force procedures—and, incidentally, these will not be exclusively the result of TPC—there are likely to be few, if any, drastic changes.

In the Air Force we are currently looking closely at all of our procedures with a view toward their further improvement. In AFSC Manual 375-1, dealing with configuration management, we are assuring that our policy is clear and procedures flexible enough to properly align authority and responsibility with respect to change decisions.

We are also reviewing the instructions in our 375 series manuals for preparation of hardware specifications to assure their support of TPC procurements. There must be no confusion as to the quality, scope and specific definition of contract performance requirements and the test and quality assurance associated with these requirements.

In AFSC Manual 375-5, dealing with system engineering management procedures, the Air Force will provide specific instructions to tailor system engineering requirements to TPC procurement. For example, the present manual suggests a requirement for approval of detailed contractor design decisions. The inconsistency of this requirement and TPC objectives is recognized.

We are also insuring that the 375-5 manual can at least be used as a guide for engineering or management rather than a rigorous contract requirement.

We are taking a hard look at our data reporting requirements. We learned in the C-5A program that the unusual definition requirements of TPC during competition may produce vast volumes of data, the requirement for which is suspect. In fact, the five contractors together submitted a total mass of data that weighed over 35 tons. One contractor filled an entire aircraft with data and flew it to Dayton, Ohio, for evaluation. Over 400 people spent two and one-half months—a total of 132,000 manhours—reading and evaluating the proposals. Our review indicates that our total data requirements could be drastically reduced.

In Air Force Systems Command/Air Force Logistics Command Manual 310-1, dealing with data management, we are reconstructing many of our data items so they may be used selectively either for control under high risk cost-plus-fixed-fee contracts or for visibility under fixed-price contracts.

This is just a sampling of the continuing efforts not only to align our management procedures for TPC, but also to improve them generally. Many of the actions that have bearing on TPC were started before TPC was applied.

For example, the Air Force has had a formal cost management improvement program since July 1964. The purpose of the program has been to improve financial management of systems programs and to reduce the amount of data needed to do the job. Basically, what we have done is to establish standard data reporting criteria. We have not attempted to impose a single financial management and data collection system. We expect the contractor to build his own financial management system and we ask only that he meet our reporting criteria.

The criteria have been published in a Cost/Schedule Planning and Control Specification. The specification is a contractual requirement on the C-5A, F-111, Manned Orbiting Laboratory (MOL), and Short Range Attack Missile (SRAM) programs, which is a good indication of the flexibility of the concept. One result is that a specific financial management system, designed exclusively for total package procurement, has not been required.

Some important benefits to this approach are:

- Individual contractors will receive only one kind of demand for financial management information from system program directors, whether or not TPC is applied.
- The use of the same data by both the contractor and the system program director for management of the program will greatly improve accuracy and reliability.
- A valid base is established for effective response to management information requirements of Headquarters, U.S. Air Force, and DOD, with minimum impact on contractor operations.

To sum up briefly, TPC does have some significant impacts on our management systems. These impacts tend to be more on how our management systems are used rather than on their actual structure. It is reasonable to draw at least four basic conclusions:

- TPC must be applied on a selective basis not only where whole programs are concerned, but also where certain portions of given programs are concerned.
- TPC requires careful structuring of incentives in order to assure achievement of program objectives and to offset the inhibition of technological innovations.
- TPC requires unique recognition of contractor cost risks.
- TPC is well within our management state of the art, but it highlights the need for better understanding of the flexibility of our management systems and realism in their application.

The Impact of Vietnam on the Army RDT&E Communications-Electronics Effort

by
Lt. Gen. A. W. Betts, USA
Chief of Research and Development
Office of Chief of Staff, U. S. Army

In 1962 the Army underwent a major reorganization, particularly as far as the processes for determining future materiel requirements and the research, development, procurement, supply and maintenance of materiel (Figure 1). The processes of determining how the Army of the future should be equipped, how it should be organized, and how it would fight were elevated into a consolidated and separate major field command—the U. S. Army Combat Developments Command (CDC). Concurrently, the majority of the old individual Technical Services of many years standing were abolished in favor of a consolidated command structure which was more functionally oriented. From this reorganization came the U. S. Army Materiel Command (AMC). With the establishment of these new major commands the Army was following a course of continuing management improvement and evolution.

Also, until the 1960's, the principal threat to the United States and the Free World was interpreted in the form of overt massive formal military action. As such, the materiel requirements, which were in the Army's research and development stream, were being developed in response to this threat. However, with the recognition that the covert threat—the limited war, the so-called war of national liberation—was to pose a growing commination, the Army responded to the changing of additional materiel requirements imposed by this threat.

One of the first steps was the establishment of the U. S. Army Limited War Laboratory (LWL) at Aberdeen, Md. (Figure 2). The mission and purpose of this organization are to provide a quick-reaction facility for the development of specialized limited war items—relatively small pieces of equipment—the need for which arose from experience and study in combatting the lower ends of the conflict scale. This laboratory is item oriented rather than system oriented. Quite often the solution reached by the LWL staff to a problem is a modification to existing off-the-shelf commercial equipment.

About the time that the laboratory became operational, U. S. involvement in Southeast Asia was largely in the advisor role—with Special Forces teams operating over wide parts of Vietnam. From their experience came a Combat Developments Command Special Forces Communications Study completed in June 1963.

The purpose of this special study project was to determine user requirements for man-pack jungle communications, the adequacy of current equipment in the field of jungle communications, changes in techniques and concepts of employment to increase the efficiency of current equipment in the jungle, and the availability of commercial equipment to provide interim solutions to jungle communications problems.

As a result, the Army staff directed AMC to implement the recommendations of this study. The recommendations included the modification of existing sets such as the AN/GRC–87, the issue of a U. S. Marine Corps AN/PRC–41, the procurement of commercial equipment for evaluation such as the HC–162, Gonsett and Skycrafter ground-to-air units. At the same time development of equipment continued to meet current approved Army statements of materiel requirements.

Several items have been developed, or are being developed, to meet Special Forces requirements. As might be expected, the Special Forces requirements are similar to those of jungle communications. The base station for Special Forces, providing long range communications with outstations, was developed for Special Forces use and has been shipped to Vietnam. The AN/PRC–64, an LWL development, is in use as a lightweight patrol set for Special Forces. In general, Special Forces requirements applicable to jungle communications have preceded those of conventional forces.

There was still another major action under way at this time which would also have repercussions on the

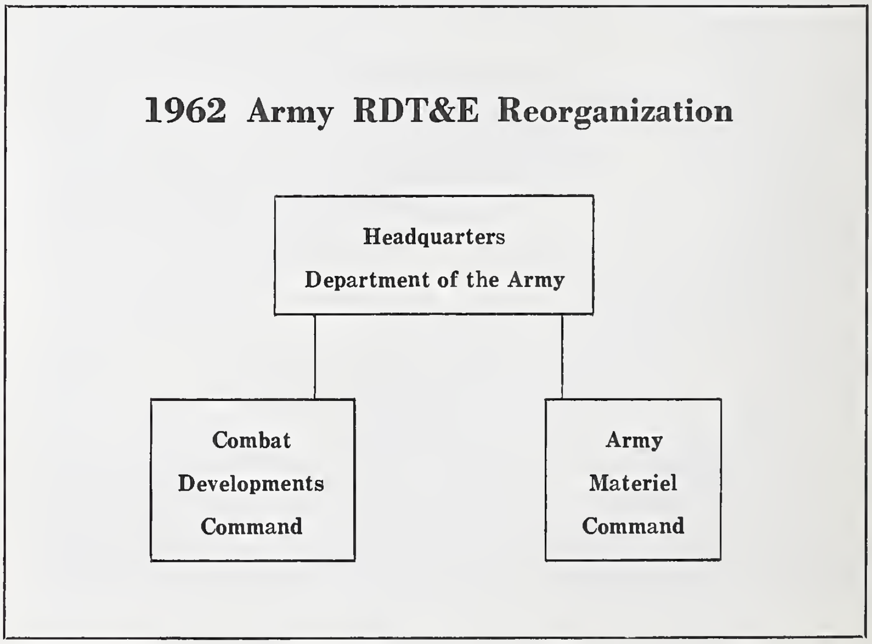

1962 Army RDT&E Reorganization
Headquarters Department of the Army
Combat Developments Command
Army Materiel Command

Figure 1.

Army's electronics program, and this was the testing of the air mobile concept. This concept was tested by the 11th Air Assault Division at Fort Benning, Ga., and, upon the successful completion of the test program, the unit was reorganized and redesignated the 1st Cavalry Division (Airmobile).

During the initial test program the 11th Air Assault Division installed a number of standard communications equipments in one-quarter-ton trucks in order to facilitate their movement by helicopter. Most of this equipment was taken to Vietnam by the 1st Cavalry Division (Airmobile) and has been used with success. Additional items were procured commercially and, where satisfactory, were retained by the division. Included were items of radio relay and radio terminal equipment such as the AN/MRC–112 composed of the AN/GRC–10 radio and AN/TCC–3 multiplexer. The requirements for lightweight equipments for airmobile use developed by the 11th Air Assault Division have proved to be those of other units operating in Vietnam as well.

With the increased tempo and involvement of U. S. Army units in the Vietnam action, there has been a renewed awareness for the need of improved performance and reliability while reducing the size of communications-electronics equipment. In addition, the U. S. Military Assistance Command-Vietnam and the U. S. Army-Vietnam have shown increasing interest in filling technological gaps and are asking for more modern equipment. A number of actions have been taken to respond to Vietnam requirements as rapidly as possible. These actions include modifying the procedure for establishing requirements to allow the Office of the Chief of Research and Development to initiate development of an item upon validation of a request from Vietnam, limited-production type classification to reduce administrative time, sole-source procurement to accelerate contract award, and quick-reaction fabrication at Army Depots.

An example of Army Research, Development, Test and Evaluation (RDT&E) action for Vietnam in response to these conditions is the expedited development of the forward-area PPS–5 surveillance radar. A 360-degree countermortar radar is also receiving expedited attention.

Looking at the matter from another angle, just what have been some specific effects of Vietnam RDT&E needs on the normal requirements/RDT&E process? The first answer is that we have found the normal system a little too slow and formal for many of the requirements emerging from Vietnam. This has resulted in two programs: Project PROVOST (Priority Research and Development Objectives to Support Vietnam Objectives) and the ENSURE process.

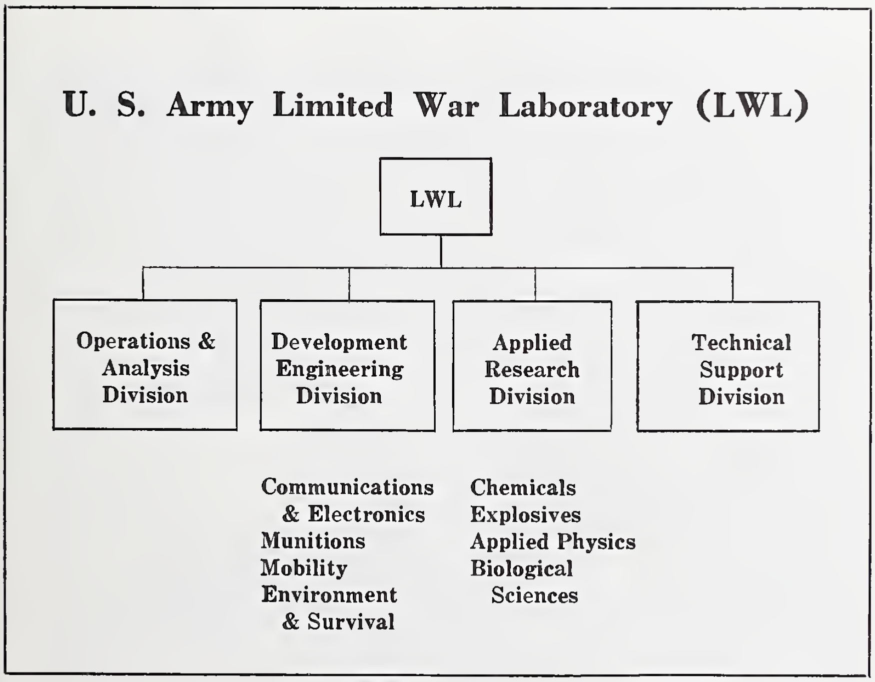

U. S. Army Limited War Laboratory (LWL)
LWL
Operations & Analysis Division
Development Engineering Division
Applied Research Division
Technical Support Division
Communications & Electronics
Munitions
Mobility
Environment & Survival
Chemicals
Explosives
Applied Physics
Biological Sciences

Figure 2.

Project PROVOST was initiated in August 1965. It began with an estimate of weapons and equipment that could be made available in the near future, programs or developments the Army felt should be accelerated, and new programs that should be started in the light of Vietnam requirements. As a result numerous projects were selected for accelerated effort in FY 1966 and financed by approximately $14.6 million in emergency funds and $28 million in supplemental appropriations. Included in the list were a variety of surveillance devices, weapons, munitions and personal equipment. This effort is being continued.

In addition, special procedures have been established to expedite requirements for development or procurement of materiel items that are not available in the Army inventory. These are items which are urgently needed to provide a new or improved operational capability and of a nature which permits development or procurement in sufficient time to support the stated requirement. This is the so-called ENSURE process. In effect, what ENSURE does, so far as the research and development aspect is concerned, is to permit the requirement from the field to come directly to the Department of the Army—specifically the Assistant Chief of Staff for Force Development (ACSFOR)—rather than to CDC. Naturally, information copies of such undertakings are provided to CDC. ACSFOR screens the requirement to determine its validity and the appropriate General Staff agency responsible for approval, and initiates action to develop or procure those items within the purview of ACSFOR.

Here a word of caution should be injected! Too many shortcomings in raw material reaching the field have been coming to light, particularly in the old reliability and maintainability areas. Part of the solution to this problem, the Army believes, may rest in our current test and evaluation process and, because of this, the Army is now reviewing its entire process. It will certainly result in an increased emphasis on this phase of research and development, particularly those areas mentioned—realiability and maintainability demonstrations during and at the conclusion of the development programs as well as for

(Continued on Page 16)

The Navy's Deep Submergence Systems Project

by

Dr. John P. Craven

The U.S. Navy has long been interested in oceanographic research and has been able to accumulate a considerable store of information about the topography of the ocean floor; marine animal and plant life; the chemistry of the seas; and the effect of sea, air and land on nature's most basic functions.

Over the years some knowledge has been gained about the continental shelves which slope away from our shores for a distance of from 10 to 200 miles. But most of the 140 million square miles of the ocean floor remain uncharted. Our best information, until recently, has been obtained by accoustic sounding. Use of the deep-diving bathyscaph, Trieste, was the first successful attempt by the Navy to obtain information first hand from the depths of the ocean. Our ability to work at deep levels is still quite limited.

The lack of U.S. capability for deep sea exploration and its collateral benefit, deep ocean rescue, was painfully apparent when the submarine USS Thresher sank in more than 8,000 feet of water in April 1963. It was this accident which triggered the Deep Submergence Systems Review Group and set the stage for a comprehensive effort by the Navy in the deep ocean.

The Deep Submergence Systems Review Group.

The Deep Submergence Systems Review Group, under the chairmanship of Rear Admiral E. C. Stephen, USN (Ret.), was given responsibility for a comprehensive review of the Department of the Navy plans for location, identification, rescue from and recovery of deeply submerged objects from the ocean floor; for recommending changes in such plans to provide both expeditious and long-term improvements; and for developing a five-year deep submergence program for the Navy. The major goal of the review group was to recommend reliable systems for recovery of both men and objects from the ocean.

The study illustrated two important facts to the group. First, the Navy could not recover lost items by dangling hooks at them from two miles above. Second, rescue missions cannot wait weeks or months until weather conditions are satisfactory for operations.

All of today's methods have their limitations. The Trieste is more suitable than other systems, but even it falls far short of the mark. Trieste is surface based, has a limited horizontal cruising range, and is capable of performing only very light work while on the bottom.

The Deep Submergence Systems Project.

On May 28, 1964, Secretary of the Navy Paul H. Nitze announced that he had accepted the report of the Deep Submergence Systems Review Group and had assigned implementation of a Deep Submergence Program to the Navy's Special Projects Office under the Chief of Naval Material in accordance with the latter's recommendation.

Assignment of the Deep Submergence Systems Project (DSSP) to the Special Projects Office reflected the importance which the Navy attached to it.

Important also, in the assignment of DSSP to the Special Projects Office, was the need to insure proper coordination with the many other organizations which have program responsibilities or vital interests in ocean engineering.

Dr. John P. Craven is Project Manager of the Deep Submergence Systems Project of the Department of the Navy. He also serves as Chief Scientist of the Navy's Special Project Office, a position he has held since 1959.

On May 26, 1966, after nearly two years under the management of the Navy's Special Projects Office, DSSP was officially established as a Navy field activity and a separate project under the Chief of Naval Material. During this period the program gained substantial momentum. Together with its national significance, complexity, and broad development potential, intensified management and focus of effort was required. As a designated project, DSSP will create an environment in which a program visibility will be established and which will provide, on a continuing basis, the attention of top Navy management.

Within the broad scope of various Navy ocean science programs, DSSP has been assigned primary responsibility for directing, coordinating and programming a substantial portion of ocean engineering research and development funds within DOD. The magnitude of the program is noted in its funding level of about $300 million dollars spread over the 1966–1972 time span.

Although the overall program is clearly Navy oriented, it should be recognized that the techniques and basic principles acquired in developing military ocean engineering capabilities can be equally applied to commercial and other multi-purpose civilian programs.

The broadest Navy objective in supporting ocean science technology is to gain knowledge in order to operate throughout the ocean volume, and the DSSP program elements deal with the following specific areas:

- Submarine Location, Escape and Rescue.
- Object Location and Small Object Recovery.
- Man-in-the-Sea.
- Large Object Salvage.
- Nuclear Powered, Deep Submergence, Research and Ocean Engineering Vehicle (NR–1).

Submarine Location, Escape, Rescue.

- **Location:** The objective is to achieve a capability to locate a distressed submarine and determine the cause and nature of disablement.
- **Escape:** A program to improve present submarine and undersea vehicle escape capability is planned

which includes immersion suits and one-man life rafts to increase survival possibilities of escaping personnel.

- **Rescue:** A new system is planned to permit the rescue of surviving submarine personnel under all-weather conditions, under ice, and at depths as great as present submarine collapse depths. This system will consist of three units of rescue submersible vehicles, each unit to be comprised of two vehicles. These vehicles will be air transportable to provide rapid response to an undersea disaster anywhere in the world. They will be carried to the scene of operations "piggyback" aboard a nuclear submarine or aboard a specially designed surface ship. The vehicles will be constructed to operate at a maximum depth consistent with technology and cost constraints. Each will have a crew of two operators and two medical corpsmen and will be capable of transferring 24 survivors on each trip from the disabled submarine to the mother submarine.

Lockheed Missiles and Space Company of Sunnyvale, Calif., has been competitively selected to design and construct the prototype rescue vehicle. Operator and maintenance crew training is to be started during 1966–1967.

Object Location and Small Object Recovery.

More than 80 percent of the ocean volume lies below present Navy operating capabilities. A system is needed to permit surveys, investigations and recovery of small objects, such as ordnance and small parts of ships from depths up to 20,000 feet. A search test vehicle will be designed to evaluate new materials and equipment. In addition, a deep sea test range will be developed to test concepts and vehicles equipment and systems under controlled and monitored conditions. This range will provide services for all elements of the project. Research will also be conducted on material problems associated with 20,000-foot depth vehicles.

Man-in-the-Sea.

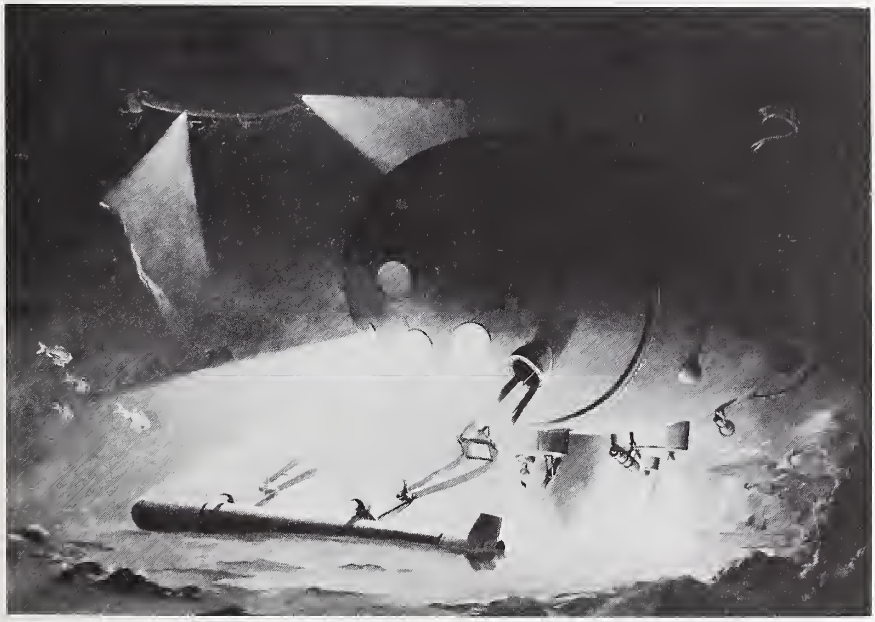
This system's objective is to provide a capability for support of rescue and salvage operations, maintenance of bottom-mounted equipment, exploration and exploitation of the continental shelf, and possible assistance in military operations associated, for example, with mine defense and amphibious assaults. Emphasis will be on the adaption of men to the deep sea environment at ambient pressure for the particular depths of operations. The program will also increase the effectiveness of all other DSSP systems. Man-in-the-Sea will involve:

- Mobile pressure equipment development needed for decompression.
- Physiological research and experimentation.
- Surface ship modifications to support diving operations.
- Advanced sea habitations to provide underwater living and storage facilities to future aquanauts.
- Development of auxiliary items such as diver-to-diver communications, and improved underwater propulsion devices.

In addition, an advanced development objective exists for extension of man-in-the-sea technology, first to depths below the continental shelf and ultimately down to the physiological limits of man. Initially, one advanced sea habitation and its auxiliary equipment will be established on the continental shelf. Divers will then be able to operate from this shelf for a month or more without coming to the surface. A continuation of the SEALAB experiments is scheduled during the latter part of 1967 to obtain data necessary for deeper depth operations.

The next experiment, to be known as SEALAB III, will extend the depth to the 400-500-foot level in the waters off the coast of San Clemente Island, Calif. Three to four teams of six to eight divers will live in the ocean-bottom habitat for 15-day periods.

To prepare for the program, refurbishment and implementation of earlier SEALAB equipment is being started. In addition, coordination with other branches of the Navy has been effected to obtain data for the biomedical, physiological and hydrobiological tests to be studied during the open-sea experiment.



Artist's concept of the U. S. Navy's 20,000-foot Search and Small Object Recovery Vehicle.

Large Object Salvage.

This system's objective is to provide the capability to recover large objects —sunken ships—of a deadweight lift of 1,000 tons from depths up to 850 feet. To accomplish this mission, external lift will be supplied by collapsible pontoons with a combined bouyancy of up to 1,000 tons. Underwater work will be accomplished by divers equipped with appropriate tools and devices, possibly including manned vehicles. The medical and physiological reasearch and development required for safely conducting deep-diving work will be provided by the Man-in-the-Sea program. In addition, feasibility studies and prototype development will be conducted to resolve the problems associated with salvage operations at submarine collapse depth.

Buoyancy materials will be developed to lighten objects and for exert-

(Continued on Page 16)

The Electromagnetic Compatibility Requirement

by

John J. O'Neil

The following excerpt from a memorandum from the Office of the Secretary of Defense to the Secretaries of the Army, Navy and Air Force summarizes the electromagnetic compatibility problem confronting the Defense Department and the action taken to cope with it:

> **"The increasing use of the radio frequency spectrum and greater reliance on radiating devices for military purposes is resulting in a radio frequency interference problem that is of great concern. . . . A comprehensive program is hereby established to cope with radio interference between electronic equipments and systems and particularly to ensure that, to the maximum practicable extent, electronic systems will not suffer operational degradation due to the absence of appropriate means for rejecting interference and for achieving radio frequency compatibility."**

At the time of its issuance in 1960 the three Services had in being research and development programs in the interference reduction area. However, the directive gave high level support and added impetus to these programs and resulted in the first coordinated tri-Service frontal attack on a problem which dates back to the very earliest days of radio transmission and reception. Why this sudden interest at the highest DOD echelons? A review of the growth in the use of electronic equipments in the field army is one answer.

For example, the number of radio transmitters used by the field army in 1918 was between 200–300. During World War II there was a constant increase in the use of electronic equipments until at the end of hostilities our field armies were using about 20,000 radiating devices. Since World War II there has been a phenomenal growth in the use of electronics by the Army because of its need for highly mobile communications, surveillance, air defense and air traffic control.

Analysis of the electromagnetic environment of the future field army indicates a minimum of 70,000 equipments, radiating rf energy over a spectrum of at least 150 KHz to 10 GHz, will be required to carry out its mission in the desired manner. This estimate does not include the extremely low-power transmitters, nor the hundreds of thousands of unintentional emitters of interference such as vehicles, generators, motors, etc. Further, this figure is only for one field army. When the requirements of the Air Force, Navy and Marine Corps, in addition to adjacent field armies in the event of a world-wide conflict are considered, the figure becomes astronomical. Unless the design and use of these equipments is carefully controlled, the same chaotic effect as a profound enemy jamming program could result.

Definition.

What is this rather intangible requirement referred to as electromagnetic compatibility? The Department of the Army defines it as "the capability of communications-electronics equipments or systems to function in their intended operational electromagnetic environment without undergoing performance degradation below acceptable limits due to unintentional interference, or without causing unacceptable performance degradation to other equipments and systems due to spurious, harmonic, or other unwanted emanations." It includes, but is not limited to, electromagnetic interference control which may be defined as "the adequate reduction of steady state or transient electromagnetic energy which may cause undesirable response or otherwise impair the operation of electrical or electronic equipment." Thus it is apparent that electromagnetic compatibility can be achieved in a field army only when a vigorous program of interference control is in existence.

USAECOM Program.

The U.S. Army Electronics Command (USAECOM) has as one of its functions research and development leading to economical, reliable electromagnetic interference reduction control circuitry, techniques, components and other measures which can be incorporated in, applied to, or used in conjunction with communications-electronics equipments and systems. The program in this area is divided into three major, mutually complementary areas: theoretical analysis, design criteria, and instrumentation and measurement techniques (Figure 1). Each area is expected to provide requirements to its counterpart which, in turn, is expected to provide guidance in its area of interest. The outputs are intended to result in improved equipments and systems and are constantly fed into the research and development cycle by means of information bulletins, lectures, instruction manuals and training courses. In addition, every effort is made to furnish USAECOM contractors with all possible assistance in this area.

John J. O'Neil, Dep. Chief, Electromagnetic Environment Div., U. S. Army Electronics Command, Fort Monmouth, N. J., is responsible for the control of intentional and unintentional interference in the field army.

The theoretical analysis is a map study using the field army of the time period under study as an input. The organization is developed and tactically deployed down to the smallest organizational element in a geographical area typical of where future conflicts could take place. The needs of the field army organizations for communications, combat surveillance, air navigation, traffic control, etc., are prepared to reflect all these equipments on the geographical deployment. Having determined the location of equipments, a computer is then programmed with the x and y coordinates of the equipments, propagation and frequency assignment data, and pertinent characteristics of the transmitters and receivers.

This is a very simplified explanation of a highly complex procedure. However, the outputs from such a program yield valuable data not only in the electromagnetic compatibility area, but in the equipment and system design areas as well. This data is reflected in more realistic specification requirements, improved circuitry and more practical measurement techniques. In addition, the adequacy of proposed equipment and system design and the technical feasibility of concepts from the standpoint of their electromagnetic compatibility are also obtained.

Figure 2, which is an artist's concept of a typical Division Area Communication Center, is based on an output of this analysis. It is readily apparent that, because of the necessity for numerous equipments operating in such close proximity, great care will be necessary in their design to assure electromagnetic compatibility.

Thus the analysis program is a most important tool in guiding the research and development of electronic equipments and in assuring electromagnetic compatibility and interference reduction programs that are based on a foundation of all available engineering information.

Specifications.

The requirements contained in electromagnetic compatibility and interference reduction specifications have long been subject to controversy with many contractors believing that the requirements are unnecessarily stringent. The electromagnetic compatibility engineer, having little data on which to base his requirements during the early 1950's, was prone to cite requirements which would most certainly assure interference-free operation of equipments in the field. The cost of meeting these requirements, however, was on occasion a good percentage of the overall cost of the end item.

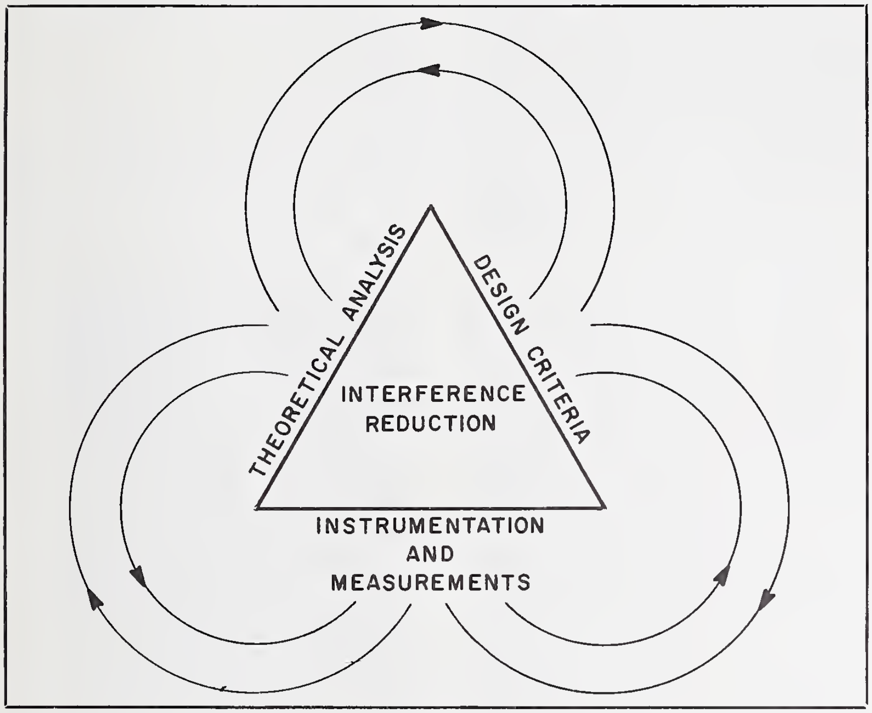


Figure 1.

Figure 2.

USAECOM, utilizing data from its analysis program, can reflect requirements in its specifications which are realistic and, although some criticism is still heard, differences can generally be quickly resolved when the contractor is fully aware of the problem anticipated when the equipment he is developing reaches the theater of operation.

The measurement procedures specified in the specifications are not ideal and certainly subject to improvement. USAECOM has long believed that the most meaningful tests can be conducted only in an open area out-of-doors. The performance of tests in a shielded enclosure is, of course, the most ideal method. This is especially true in these days of expanding suburbs where open real estate is becoming scarcer each day. Consequently a research study is being conducted to eliminate the present source of errors in the testing of equipments in shielded enclosures. This technique will utilize newly developed antennae and a new configuration of enclosure. Although proceeding very satisfactorily, it is not anticipated that this program will be completed over the entire frequency range of interest for about 18 months. This program, coupled with the development program for automated instrumentation covering the frequency range of 14 HKz to 40 GHz which will reduce testing time by 75 percent, should greatly alleviate many of the problems now encountered in the testing of equipments.

For many years the three Services have insisted with some justification that, because of their individual peculiar requirements, a single tri-Service coordinated specification for all equipments was impractical. However, over the years with improved instrumentation and measurement procedures, coupled with analysis programs and field experience, it has become possible to standardize the requirements of the three Services and incorporate them into a tri-Service document.

The document will be in the form of three Military Standards, which will detail "Requirements" (MIL STD 461), "Measurement Procedures" (MIL STD 462) and "Standardized Definitions" (MIL STD 463). The standards will incorporate requirements and procedures for testing of communications-electronics equipment, non-communications-electronics equipment, electrical equipment, and special classes which will include vehicles, power lines, etc. Drafts of these documents are now being reviewed and commented upon by industry. Although they undoubtedly will require revision for a short while after being implemented, it is believed that more uniform testing and a considerable saving of time and money will result from this program. It is anticipated that the standards will be completed during 1967.

USAECOM currently references Military Specification MIL–E–55301, titled "Electromagnetic Compatibility," as the governing interference reduction document in its procurement of electronic equipment. This specification is also used by other commands of the Army when procuring other types of interference producing materiel. It describes requirements for tactical, tactical support and administrative type equipment and combines and supersedes the requirements of four older specifications. This document has only been in use since April 1965 and has been generally well received.

In this document an effort was made to resolve a problem that has always faced the interference reduction engineer, i.e., being confronted with a piece of equipment ready for production, which does not conform to the specification, necessitating costly, bulky retrofits. Anything less than complete conformance may render the equipment, or adjacent equipment, useless when it reaches the field. It is necessary that he take an "educated guess" and attempt to recommend "hang-on" treatment which is never as effective or economical as when this problem is considered in the earliest design stage.

Consequently, MIL–E–55301 requires that the contractor submit a design plan which will specify the design aspects of the equipment insofar as electromagnetic compatibility is concerned. The preparation of this plan is time consuming. However, it is time well spent as the USAECOM specialist can generally recommend, when required, new circuitry and techniques which are frequently easier to apply, more economical, and provide greater effectiveness than that proposed by a contractor who has had little experience in this area, or who is not acquainted with the current state of the art. Similarly, a test plan is required prior to the performance of tests. This plan has proven invaluable as in many instances a contractor has overlooked requirements or proposed conducting unnecessary tests. These deficiencies, which previously would be noticed only when the test report was submitted and would on some occasions require costly re-testing, are now pin-pointed when the test plan is submitted for review. Similar requirements are incorporated in the new military standards.

Industry Management Role.

The tremendous increase in the use of electronic devices within DOD, which requires the use of the frequency spectrum for radiation or reception of electromagnetic energy, is not expected to lessen in the foreseeable future. The useable frequency spectrum is a vital resource and is insufficient to satisfy the needs of all the users unless the best possible efficiency is attained in its use. The necessity for interference reduction and electromagnetic compatibility can only increase during the coming years; like death and taxes we cannot avoid it.

It appears, therefore, that management in those companies designing and producing electronic equipments for the military should take an active role in establishing a program within the company which recognizes this problem in relation to the product (design, development, production). This program should receive full support of management and be integrated with allied efforts and progressively refined and improved to maintain state-of-the-art competence. It should assure that thorough consideration is given to electromagnetic compatibility through all aspects of design, development, production and test, as necessary.

Many contractors, recognizing the problem as one of overlapping interests, have established such programs and directed that all drawings be approved by their electromagnetic compatibility group prior to their use in the fabrication of equipment. Thus they avoid many costly mistakes in cabinet design, cable runs, assembly lay-outs, etc., and the necessity for corrective actions and retrofits. Experience has shown that the degree of compatibility achieved in an equipment is directly related to the emphasis placed on this program by management. It is believed that such a program would not only be self-liquidating in a short time, but would relieve management of many problems and delays generally encountered when least expected.

USAECOM Assistance.

As stated previously, USAECOM's electromagnetic compatibility program is intended to assure interference-free operation of Army equipments in the field. Consequently, it is necessary that very close liaison be maintained with all development engineers and that all of USAECOM findings in the areas of improved circuitry, techniques, etc., be given widespread distribution. In addition, every effort is made to give USAECOM contractors all possible assistance in this area. A two-volume "Design Guide" has been published which provides the engineer with the necessary background and techniques to enable him to minimize the interference susceptibility and generation of the equipment he designs. This publication has received wide distribution and is available at the Defense Documentation Center, Cameron Station, Alexandria, Va., 22314; or it can be purchased from the Clearinghouse for Federal Scientific and Technical Information, Department of Commerce, Springfield, Va., 22151. A continual updating program for this guide is planned. In addition, a "Shielding Effectiveness Design Reference" is now in preparation and should prove to be a valuable tool in assisting engineers to design the most effective rf shield for their purpose. This, too, will be given wide circulation.

USAECOM specialists are ready at all times to assist contractors in solving problems of conforming to the contractual electromagnetic compatibility requirement. The review of design plans, recommended state-of-the-art circuitry and techniques, and sources of supply are among the services that are provided. Experience has shown that contractors, who avail themselves of the services, have little difficulty in meeting the electromagnetic compatibility requirement.

In summary, the use of the frequency spectrum can be illustrated in an excellent analogy cited by the Joint Technical Advisory Committee of the Institute of Electrical and Electronics Engineers. In its report titled, "Radio Spectrum Utilization," the committee stated: "The spectrum can be likened to a newly inherited set of fields of tillable rolling land. At first, the heir will farm the rich lowlands where he can work with tools he already has, to grow crops with which he is familiar. Soon, as his family's needs grow, he starts tilling some of the marginal land; in some areas, he finds new techniques are needed and that soil conditions are more favorable to new types of crops. To assist him in his work, he assigns lots to his offspring, ultimately to be theirs for their families. And then the day arrives when all the land is allocated and in partial use. There are no more green fields beyond to meet ever-growing demands. . . . The farmer must now concern himself with the science of agriculture, the economics of farm yield, and the realities of the existing assignment of land."

Although interference encountered in our daily lives may cause inconvenience and aggravation, its consequences in the military are of staggering magnitude. USAECOM and the Department of the Army, as well as the other Services, are devoting considerable time and money to advance the state of the art in the area of electromagnetic compatibility and to assure that the radio frequency spectrum, one of our most vital resources, is properly used. An ever increasing use of electronic equipments by the military is necessary to fulfill its mission. Unless measures are taken during the design and development of equipments to assure their electromagnetic compatibility when deployed in the field, severe self-jamming can result. Defense contractors, who design, develop and produce military electrical and electronic equipment, should maintain close liaison with the interference reduction specialists of their procuring Service and assure that all possible actions are taken to minimize the possibility of their equipment having little value when placed in service or, in fact, operating as an effective enemy jammer.

FROM THE SPEAKERS ROSTRUM

Address by Gen. John P. McConnell, USAF, Chief of Staff, U.S. Air Force, at American Ordnance Assn. Annual Defense Preparedness Meeting, Los Angeles, Calif., Oct. 5, 1966.

Gen. John P. McConnell, USAF

Planning for a Future Force Structure

In all our planning for the future, there is one factor which we cannot plan, and that is the future itself. We must, therefore, make certain assumptions which are based on the experiences of the past and the trends of the present. On that basis we must try to protect our needs for the immediate future and chart our course for the more distant future.

The aerial weapon systems which we have in our operational inventory today were largely conceived and designed years ago when no one could have possibly foreseen that airpower was destined to play a dominant role in a guerrilla war in Southeast Asia. The fact that we do have the quantities and types of aerial weapon systems to assume this unprecedented role is a great credit to the vision and perseverance of the men who planned and fought for these weapon systems.

By the same token, it is our responsibility to make as certain as is humanly possible that the weapon systems which we plan and recommend will be equally useful and adaptable to whatever needs the future may bring.

We have witnessed so many dramatic and unpredictable events in our lifetime that it may seem futile to try to anticipate conditions and requirements some five or ten years from now. This is just about the length of time it takes to bring a modern aerospace weapon system from conception and initial development to operational readiness. While the future holds many unknowns and variables, there are also some factors that give us a broad indication of what to expect and plan for.

In contemplating the future, there are four general areas of unpredictable developments, that is, developments over which we have little or no control. These areas are: political developments, military developments, technological developments, and catastrophic events.

Political developments may continue to bring about radical changes in the international power balance and the alignment of nations. Today's bitter enemy may be tomorrow's close ally and vice versa. I cite the example of Japan which was our ally in World War I, our enemy in World War II, and is now one of our staunchest allies. No one can predict the course of the Sino-Soviet split; it may be breached or result in a stand-off or, conceivably, lead to open hostilities. Revolutions and insurgency or the rise of a Hitler-type dictator somewhere in the world could possibly spark a major conflagration.

Wherever we look there are potential trouble spots, and chances are that there will be more and still graver threats to world peace in the years to come. One reason for this is the rising tide of nationalism among some of the developing nations. Another reason is the host of problems that will be caused by the population explosion. Ever worsening lack of food and essential raw materials, if not of actual living space, may induce some nations to try to take by force what they need from their more fortunate neighbors.

All these potential developments on the international scene will have a direct bearing on our national interests and will compel us to take some action, either for our own protection or that of a friendly nation which seeks our help. Examples of the past are our actions in the Quemoy, Lebanon and Cuban missile crises. No one can predict what crises we may face in the future, where they will occur and when, and what action we may have to take.

Closely related is the next area of unknowns—military developments—which, though not of our making, will involve us in one way or another. I am referring, in particular, to unprovoked acts of armed aggression such as we have had to help counter in Korea and, presently, in Vietnam. We must endeavor to deter and prevent such aggressive actions but, for some time to come, we can expect the communists to continue encouraging and supporting these so-called "wars of national liberation." Where and when the communists will strike next, we do not know and, perhaps, they do not know themselves.

Nor are future military developments that may pose a threat to us limited to local aggression and conventional wars. Looking further ahead, we must be prepared to deal with the problems resulting from nuclear proliferation. The prospects of Red China's intents, once she achieves an operational nuclear capability, are rather ominous. There is also evidence that a number of other and smaller nations will endeavor to join the expanding nuclear club, either for their own protection or for aggressive purposes.

Looking still further into the future,

it is conceivable that some ambitious dictator or belligerent nation will try to exploit the space medium for aggressive purposes, regardless of any international agreements to the contrary. Even a small nation, building on the developments made by larger and more affluent countries, could thus achieve political and military advantages out of proportion to its size and resources.

This brings me to the third area of unknown and unpredictable factors, namely, technological developments which may have a revolutionary impact on the means and techniques of warfare. As far as our own efforts are concerned, we have a fairly good indication of the advances we can expect to make in the years ahead, although some dramatic discovery or new phenomenon can lead to surprising technological breakthroughs. Needless to say, we cannot count on such breakthroughs, let alone incorporate them, in our planning for the future. Yet, with our accelerating progress, the next decade or two may bring scientific developments that defy our imagination today.

Even more difficult to anticipate are the technological developments pursued by hostile and potentially hostile nations, because their efforts are normally cloaked in the greatest secrecy. A major breakthrough on their part could seriously threaten the military superiority which we still possess today. For instance, if the Soviets should succeed in developing a highly effective defense against our ballistic missiles, perhaps based on some dramatic new discovery, they would gain an advantage comparable to our atomic monopoly after World War II.

The final area of unknowns for the future are catastrophic events such as major earthquakes and other disasters of far-reaching consequences. You may remember that the devastating earthquakes which Japan suffered in 1923, at a cost of over 120,000 lives, completely upset the timetable of the war lords who were then in power in that country. The most disastrous earthquake in recorded history occurred some 400 years ago in China when reportedly 830,000 people were killed. Disasters of such proportions can change the course of history and, in fact, can make helpful friends out of enemies or out of an aggressor and his intended victims.

From what I have said so far, it may appear that the future is fraught with so many unpredictable threats and variables that it is all but impossible to plan for it realistically and effectively. But sane analysis also permits certain conclusions which, if properly applied, can be used as broad guidelines for our planning, especially with respect to the military aircraft we may need in the future.

For one, we can be certain that, for many years to come, the world environment will be marked by instability, unrest and a wide range of conflicts. We also know that there will be continuing threats to our national interests and, indeed, our security. Since we are the most powerful and prosperous country on earth, the nations of the Free World will continue to look to us for leadership and assistance. By the same token, the forces of aggression will, as heretofore, consider us the main obstacle to the attainment of their objectives and will, therefore, endeavor to sap our strength by drawing us into conflicts of every conceivable type.

Hence, our commitments, as well as our involvements, will remain global in scope as they have been since World War II but, because of the growing capabilities of our opponents, they will doubtless place increasing economic and military demands on us. Finally, we must anticipate that we may become involved in conflicts at any level of intensity, ranging from local crises and insurgency to limited wars and, possibly, nuclear aggression.

All these conclusions establish the general environment for which we have to plan. Since we cannot predict the specifics, our plans must be flexible enough to be adaptable to unforeseen conditions and developments. At the same time, however, our plans must be definite enough to allow us to prepare ourselves adequately for any future contingency and threat.

Such planning is far more difficult and complex for the military than for any other area of national endeavor. We know that, regardless of what the future may hold, we as a nation must remain strong economically, scientifically and morally. But our strength in these areas is not measured in relation to someone else's "counter-strength" nor is it subject to unpredictable influences.

The opposite is true for the military strength which we require today and will require in the world of tomorrow. It makes little difference how strong we consider ourselves militarily; what counts is what our enemies and potential aggressors think of our military capabilities in relation to theirs and with respect to their intentions.

Our first problem, therefore, is to try to identify the most likely and serious threats and plan accordingly. This is as much a matter of assumptions as of interpretation, and the next problem is to get agreements on the assumptions and approval of the interpretation. Just try to imagine the reaction if, a few years ago, the Air Force would have asked for many millions of dollars worth of conventional bombs so that, in case we should become involved in a guerrilla war somewhere in Asia, we would not be caught with our munitions down!

Fortunately, there is one constant factor in this perplexing equation of variables and unknowns, and that factor is our national policy. It has been, still is, and will continue to be our national policy to help establish and maintain a world environment in which sovereign nations can prosper and pursue their chosen way of life without fear of aggression. The pursuit of this policy is not only in our own national interest but is also a moral obligation befitting this, the greatest nation on earth.

The role of the military in the attainment of these national objectives is to serve our Government as an instrument for the management of conflicts which threaten the security and welfare of this country or of any other free nation. While our national objectives do not change, the conditions under which we pursue these objectives keep changing constantly and profoundly. This means that our military strategy and, hence, our military capabilities must change commensurately.

For a number of years following World War II our military strategy was based primarily on the problems of nuclear war and its deterrence. As the Soviets kept building up their nuclear capability, our military strategy underwent various modifications which were intended to provide the best deterrent to nuclear aggression under prevailing conditions.

The prevention of nuclear war has remained our principal task to this day and will remain so throughout the indefinite future. The preservation of our nuclear superiority on one hand and, on the other, our demonstrated determination to prevent nuclear war have induced the communists to resort to conflicts at the lower levels of intensity. This, in turn, compelled us to place increasing emphasis on our conventional forces in addition to maintaining a credible margin of nuclear superiority. Thus our strategy grew into one of "flexible response," designed to give us a range of options in responding to acts of aggression under the protective "umbrella" of our nuclear deterrent.

The question arises what kind of military strategy we will need to meet the broad requirements and uncertain threats of the future. Recent events have shown that conflicts with which we must cope may range from local crises, such as occurred in the Dominican Republic, to large-scale limited war, such as we are now fighting in Southeast Asia. With Red China approaching an operational nuclear capability and with the chance of nuclear proliferation, the possibility of nuclear aggression cannot be ruled out either.

This means that, in order to cope with the increasingly demanding conflicts of the future, we must be fully prepared to act or react and to deter or, if necessary, fight at any level across the entire spectrum of conflict intensity. This is indeed a big order, and we can fill it effectively and economically only through a well planned management approach which is designed for the whole conflict spectrum, rather than rely on unplanned "ad hoc" strategies. For this reason we are gradually turning to what may be called the "military strategy of conflict management." This wide-ranging strategic concept serves the following objectives:

- Still foremost, deter nuclear war by maintaining a sufficient margin of strategic superiority to assure the destruction of any aggressor and to keep the potential damage to ourselves within acceptable limits.
- Endeavor to deter conflicts at all lower levels of intensity and, if deterrence should fail, keep such conflicts at the lowest possible level and help resolve them to our advantage.
- Assist in the resolution of local crises and help prevent them from expanding into armed conflict.

To achieve these objectives, the strategy of conflict management requires a force structure which meets the following conditions:

- It must be capable of instant and effective reaction to any demands made on it by our national leaders.
- It must possess such flexibility that it can be adapted to any conditions, scope and level of conflict, offering a wide range of options and be responsive to any changes in organization and tactics.
- Weapon systems and equipment must be superior to those of any enemy and be adaptable to unprecedented requirements or conditions.
- Since we cannot afford to maintain forces and bases at or near every potential trouble spot around the world, there will be an expanding requirement for mobility. This calls for further emphasis on airlift which must serve to deploy increasing numbers of troops with their equipment to any place on earth, and to do so expeditiously and safely.
- The global deployment of our forces and the need for rapid, well coordinated action demand highly advanced command-and-control systems which are foolproof, reliable and survivable under the most adverse conditions.

Time does not permit me to go into further details but there is one more requirement I want to mention, and that is the need for achieving all this at an acceptable cost. Economics may be secondary where the very survival of our nation is concerned, but we cannot afford to strain our economy to the point where physical survival would become meaningless. I am confident that, through wise management and good judgment, we can obtain and maintain a force structure that meets the military demands of the future and yet imposes no undue strain on our economy and resources.

Address by Hon. Robert A. Brooks, Asst. Secretary of the Army (Installations & Logistics), at Annual Meeting of the Association of the U.S. Army, Washington, D.C., Oct 12.

Hon. Robert A. Brooks

Defense Materials System

(*Editor's Note: Although this address is repetitious to some degree of the articles on the Defense Materials System published in the November issue of the* Bulletin, *it is carried here to emphasize the importance placed on the operation of the system by key Defense officials.*)

World conditions today demand many unprecedented efforts to insure our national security. Increases in the size and composition of our defense program are certainly evident of such endeavors. There are many measures which can be taken by the Government to protect our national security. The deployment of military forces to various parts of the world, the development of new weapon systems, and foreign aid are a few examples which are familiar to most Americans. Other measures are not so obvious to the general public. One of these is the operation of the Defense Materials System in our economy and this is the primary topic of my discussion.

While I don't propose to go into the details of the operation of this system, I think it is both timely and very important that industry be made fully cognizant of its existence, its purpose and its requirements. (*See "The Defense Materials System and Priorities," page 1, and "The Use of DMS and Priorities by the DOD and*

Defense-Related Agencies," page 8, Defense Industry Bulletin, November 1966.)

The Defense Department finds itself in a unique situation probably never experienced in the same degree in the history of this country, or any other country for that matter. I am referring to current efforts toward maintaining the defense posture in support of a significant effort in Vietnam, while at the same time avoiding imposing any real controls or restrictions on the civilian economy. Naturally, our first concern is focused upon meeting military requirements in a timely manner. However, there is a concurrent and concerted effort within DOD to avoid actions which might create an adverse impact on the civilian economy. Obviously, this is a most difficult task, one requiring a sound and healthy economy which is prepared and willing to support the efforts necessary to assure our national security.

Several trends have been uncovered which indicate that industry and Defense are beginning to feel the pinch of trying to satisfy increased defense requirements in an economy which is straining to meet increased consumer demands. In this connection, the Army has detected a reluctance on the part of industry to respond to invitations to bid and requests for proposals. By way of an example, a review of five separate solicitations showed that out of 233 companies solicited, just four responses were received. This is not an isolated instance; there are other examples of similar magnitude listing such reasons for non-response as: engaged in other work, insufficient capacity, unable to meet delivery schedule, prefer commercial work, and just not interested.

Another factor, which is perhaps cause for greater concern, focuses upon increased lead times for many items which we procure. For example, needed forgings, castings and extrusions appear to be the pacing factor in many instances. This particular problem was considered of sufficient magnitude to warrant studies by the Air Force and the Army and, late in September, the Assistant Secretary of Defense (Installations and Logistics) asked the Air Force to head up a DOD team to study the situation and make recommendations. It is contemplated that industry cooperation will be enlisted to assure proper consideration of this problem.

While such trends tend to indicate that sellers' markets prevail, that a tight labor market exists, and that there is strong competition for certain materials, components and machine tools, the Army is not yet convinced that industry has reached the saturation point. However, these trends are sufficient to warrant increased study and remedial action within the limits of current policy and procedures. Some of the steps which have been taken to adjust our procurement programs to the stresses of the present economic environment are:

- Increased use of range bidding where production capacity is limited.
- Increased use of multi-year procurements to take advantage of standardization and stabilized prices over a longer period of time.
- Advance release of procurement information to enable industry to better plan its production.
- Maximum utilization of Government-owned production capacity. Eight reserve Army plants were reactivated during FY 1966. In addition, tools have been diverted from other standby packages to meet active production requirements, where appropriate.
- Release of materials from the national stockpiles.
- Use of substitute items and materials, where feasible.
- A greater emphasis on use of the Defense Materials System.

I would like to specifically call your attention to the latter, the Defense Materials System, usually referred to as DMS. To provide the President with the necessary authority to promote the national defense, the Congress has continued in effect the Defense Production Act of 1950, as amended. The act authorizes the President to:

- Require that performance under contracts or orders, which he deems necessary or appropriate to promote the national defense, shall take priority over performance under any other contract or order, and to require acceptance and performance of such contracts or orders in preference to other contracts or orders by any person he finds to be capable of their performance.
- Allocate materials and facilities in such manner, upon such conditions, and to such extent as he shall deem necessary or appropriate to promote the national defense.

The President, by executive order, has delegated these authorities to the Office of Emergency Planning. This office has, in turn, delegated to the Secretary of Commerce the responsibility to administer the priorities and allocations functions with respect to industrial production, construction and most materials. DMS is the means employed to carry out these authorities and it is designed to accomplish two main purposes. First, it is a means of directing the flow of materials and products to insure that defense programs are maintained on schedule. Second, the operation of the system permits the maintenance of an administrative means for promptly mobilizing the industrial resources of the country in a limited or general war. This is not a standby system of priorities. It has been in continuous operation since 1953. However, until recently there was only a limited need for recourse to priorities assistance since the national industrial economy was generally able to supply defense needs at the requested rate. Increased defense requirements to support the buildup in Vietnam placed a sudden demand on the need for special priorities assistance. Within the Army Materiel Command (AMC) alone, the number of requests for special priorities assistance rose from 57 in January 1966, to 98 in February, and 196 in March. This rapid increase leveled off in April and AMC is currently processing approximately 160 requests per month. Between January and August, AMC processed a total of 1,182 such requests. This is considered a substantial increase when compared with a total of 391 processed during calendar year 1965. A significant number of these requests were for production equipment for defense contractors, a good indication that industry has been required to expand capacity to assist DOD in meeting its increased requirements. The majority of these cases involve a hard core of critical items, materials and components. Examples are extrusions, forgings, castings, electronic components, machine tools, canvas, nylon webbing, electric cable and magnet wire. Suppliers are reporting that their order boards are filled to capacity with rated orders and it appears that competition between rated orders exists at the lower subcontract levels as well as at the prime contract level.

In an effort to cope with this condition, the Defense Department and the Business and Defense Services Administration (BDSA) jointly conducted 30 orientation meetings across the country for both industry and Government personnel during April, May and June of this year. In addition to conducting orientation meetings, DOD reinstated the scheduling procedures designed to spread production of short supply items among the various military customers in an effort to assure that deliveries are made according to individual program urgencies. Notwithstanding these efforts, there is much that needs to be accomplished within DOD, associated agencies and BDSA. Two specific areas which were highlighted for further effort were a need for additional education on the use of the Defense Materials System, and a need to provide adequate personnel support for proper manning of the offices responsible for priorities and allocations functions. Both areas are receiving continuous attention.

I want to emphasize that under the authorities of the Defense Production Act, contractors can be required to accept and perform under contracts and orders which the President deems necessary to promote the national defense, and that such contracts and orders take precedence over other contracts and orders. I also want to emphasize that use of the priorities rating is mandatory for industry as well as DOD. Nearly all defense orders bear a priority rating. There is an optional provision for contracts and orders under $500, but the current practice is to rate even these small orders. The mandatory use of ratings protects the priority status of the procurement cycle throughout the entire chain of supply from the originating Defense agency down to the lowest tier subcontractor and supplier.

There are just two ways in which a priority rating can be obtained. One is through a Government agency authorized to assign priority ratings. The other is through your customer producing under a rated order. There are just two ratings which can be assigned. One is called a DX rating and the other a DO rating. DX is the higher rating and is assigned only as an emergency rating in cases of extreme urgency. All DX ratings have equal preference, but take precedence over all DO or unrated orders. All DO ratings have equal preference, but take precedence over all unrated orders.

The DX rating is assigned to certain programs selected by the President as having the highest national priority. Except for these designated programs, DX ratings are assigned as a bottleneck-breaking device, and are issued only by BDSA. Further, all DOD-rateable contracts include a uniform priorities and allocations clause which requires the contractor to comply with BDSA regulations in obtaining materials and products needed to fill his contract or order. Copies of pertinent BDSA regulations may be obtained from Department of Commerce regional offices.

Programs having the highest national priority are very few in number, of a relative small dollar volume, and are deemed of such importance that every possible authority is used to prevent them from being delayed. At present, DX-rated programs are 14 in number and are known as "Brick-Bat .01" programs. Twelve are administered by DOD and two are administered by the National Aeronautics and Space Administration. The total dollar volume of all 14 programs is less than 25 percent of the total rateable procurement. A limitation of 25 percent is placed on such programs to keep the DX rating meaningful.

In some cases, the regular procedures provided by the Defense Materials System may not be sufficient to enable contractors to fulfill defense deliveries on schedule. This may result from a variety of situations such as conflicting rated orders on the supplier's schedule, inadequate facilities to produce the required product, and the like. To aid defense contractors in overcoming such production bottlenecks, or to expedite deliveries, BDSA provides special assistance. Under such conditions the contractor may submit a request for special assistance to the local office responsible for administering the contract. This request is submitted in accordance with instructions from the responsible procuring agency and each agency in the chain of command attempts to correct the problem. If intermediate agencies are unable to overcome the difficulty, the request is forwarded to BDSA for appropriate action. BDSA provides special assistance in such cases by several methods such as:

- Arrangement of improved delivery dates by informal agreement with supplier.
- Issuance of a DX rating if appropriate.
- Issuance of a directive requiring the supplier to produce the specified item by a specific date.

The chances of successful action are greatly enhanced by the early receipt of such requests and the completeness and accuracy of the information furnished by the defense contractor. The special assistance procedure, however, should not be considered a substitute for early placement of rated orders on suppliers and adequate follow-up to determine that original shipping promises remain valid.

There are other means of assisting DOD in its efforts to meet increased requirements without creating an adverse impact on the civilian economy. Industry, for example, should seek every means to avoid use of critical materials through increased emphasis on value engineering. Substitution of materials may not only enhance the contractor's ability to meet delivery schedules, but may well result in increased profits. Industry should also exert every effort to seek additional sources of supply through more effective "make or buy" programs, rather than waiting for their own production capacity to open up.

A strong and ready industry is as much a part of our national defense as a competent military organization. The Army-industry relationship must be maintained as a dynamic one, whether it be the ability to produce the standard hardware, gear up to fabricate new and more sophisticated designs, or accelerate to produce the emergency requirements in support of the Southeast Asian contingency. Many firms which originally produced nothing but military products have expanded into the commercial market and have become relatively self-sufficient and no longer need to rely on defense contracts. Conversely, industrial ingenuity has also fostered the development of commercial application for many defense-oriented techniques and items. Only through continued cooperative efforts between Defense and industry can the strength of our nation be maintained to meet any threat to our security.

The Impact of Vietnam

(Continued from Page 5)

the initial production run. There is no doubt that everyone in industry can understand our concern here, and any suggestions that will assist in meeting the problem are welcomed.

In summary, it can be said that, while there has been increased interest in and emphasis on providing RDT&E support for Vietnam operations, this has been mainly for the shorter-term solutions. In addition, there has been some increased use of off-the-shelf items, particularly those which are readily modified to meet a requirement. We intend to continue this practise where it is advantageous.

We have expedited the development of electronic items wherever possible for earlier introduction into Vietnam, but the full results of these efforts are not yet available since the fielding of these units began only this year. In keeping with this practice, it is probable that some of electronics items now in the Army RDT&E program will have first use in Vietnam.

The Army's current interest in electronics is two-fold: We retain an active interest in systems and devices for use in Vietnam—on both a long-term and short-term basis; we do not intend to slight or reduce Army's RDT&E efforts in support of its world-wide missions.

Deep Submergence

(Continued from Page 7)

ing external lift. Investigation, object preparation and rigging will be accomplished using divers or manned submersibles developed under the man-in-the-sea rescue and search programs. When achieved, the system objective—deep ocean salvage—will extend man's work capabilities far below the 280 feet now attainable by standard diving methods.

Funds are to be expended for a life support system to be used as a part of salvage program as well as supporting the man-in-the-sea experiment in 1967. The life support system consists principally of a personnel transfer chamber and a rest and refuge tent habitation used at depths up to 600 feet and a surface-mounted deck decompression chamber.

Research on gas generation under ambient pressures, displacement and de-watering materials, and pontoon systems controllability is planned. Problems associated with adapting deep submergence vehicles for salvage use will also be investigated.

Nuclear Powered Deep Submergence Research and Ocean Engineering Vehicle (NR–1).

On April 18, 1965, President Johnson announced that the Atomic Energy Commission and the Department of the Navy had undertaken the development of a nuclear-powered deep submergence research and ocean engineering vehicle. The capability of this manned vehicle, designated the NR–1, will be an order of magnitude greater than any other developed or planned to date because of the vastly increased endurance made possible by nuclear power, and the technology gained by its development will provide the basis for development of future nuclear-powered oceanographic research vehicles of still greater versatility and depth capability.

The NR–1 vehicle, which will be able to move at maximum speed for periods of time limited only by the amount of food and supplies it carries, will have a crew of five and two scientists. The vehicle will be able to perform detailed studies and mapping of the ocean bottom, temperature, currents and other oceanographic parameters for military, commercial and scientific uses. The development of a nuclear propulsion plant for an oceanographic research vehicle will result in great independence from surface support ships and essentially unlimited endurance of propulsion and auxiliary power for detailed exploration of the ocean.

The submarine will have viewing ports for visual observation of its surroundings and of the ocean bottom. In addition, a remote grapple will be installed to permit collection of marine samples and other items. With its depth capability the NR–1 is expected to be capable of exploring areas of the continental shelf, an area which appears to contain the most accessible wealth in mineral and food resources in the seas. Such exploratory charting may also help the United States in establishing sovereignty over parts of the continental shelf. A ship with its depth capability will be capable of exploring an area several times that of the United States.

The Navy's DSSP office has overall responsibility for the NR–1's development. The Naval Ship Systems Command is responsible for vehicle design, development and construction. The Atomic Energy Commission's Division of Naval Reactors is responsible for the design, development, construction and test of the nuclear propulsion plant. Design and development of the reactor has been assigned to the Atomic Energy's Commission's Knolls Atomic Power Laboratory, Schenectady, N.Y. Design and construction of the vehicle will be performed at General Dynamics Corporation's Electric Boat Division, Groton, Conn.

Overseas Civil Service Positions Open

The Army Electronics Command (ECOM) at Fort Monmouth, N.J., is seeking applicants for electronic equipment specialists and training instructors to serve overseas in civil service grades GS–7 through GS–11. Salary for the open positions range from $6,451 through $9,221 a year.

Equipment specialists, grades GS–9 through GS–11, will be assigned initially to Vietnam, to work in ECOM's Technical Assistance Program.

Training instructors, grades GS–7 and GS–9, will be given frequent and short-time assignments in all parts of the world. Selectees will undergo factory or service school training, and will work in teams giving new materiel briefings and new equipment training. A basic knowledge of electronics and communications is necessary for these positions.

Specialization for the equipment specialists is in the areas of communications, surveillance, avionics, air defense and infrared. Working in the Technical Assistance Program, they provide assistance, including instruction, installation, operation, maintenance and related supply of electronic equipment for field commanders in the Army's world-wide operations.

Contact for information on the equipment specialists program is Frank P. Gavin, Civilian Personnel Div., Russell Hall, Fort Monmouth, N.J. 07703. (Area Code 201) 532–1048.

Contact for information on the training instructors program is Mrs. Josephine Jubert, Civilian Personnel Div., Russell Hall, Fort Monmouth, N.J. 07703 (Area Code 201) 532–1543.

ABOUT PEOPLE

DEPARTMENT OF DEFENSE

Lt. Gen. Theodore J. Conway, USA, has been assigned as Commander-in-Chief, U.S. Strike Command, and U.S. Commander-in-Chief, Middle East/Southern Asia and Africa, and has been named for a recess appointment to the grade of general. He succeeds **Gen. Paul D. Adams,** USA, who retired Nov. 1.

VAdm. Vernon L. Lowrance, USN, has been named Dep. Dir., Defense Intelligence Agency.

Dr. Edmund E. Dudek, formerly Technical Dir., Naval Personnel Research Activity, San Diego, Calif., has been appointed to a newly created position as Military Manpower Research Coordinator in the Office of the Asst. Secretary of Defense (Manpower).

Dr. Harold O. Wycoff has assumed duties as Dep. Scientific Dir., Armed Forces Radiobiology Research Institute.

Seymour J. Deitchman has been appointed Dir., Remote Area Conflict, Advanced Research Projects Agency, succeeding **Maj. Gen. C. J. Timmes,** USA.

Maj. Gen. Milton B. Adams, USAF, has been appointed Dep. Dir. for Forces, Defense Communications Planning Group, Defense Communications Agency.

William R. Laidlaw, Vice President of Research & Engineering, Los Angeles Div., North American Aviation, Inc., has been selected as Spec. Asst. to the Dir., Defense Research and Engineering.

Leonard Sullivan Jr. has been appointed Dep. Dir. of Defense Research and Engineering (Southeast Asia Matters).

RAdm. Fowler W. Martin Jr., USN, has been designated commander of the Defense Fuel Supply Center, Alexandria, Va.

Col. John G. Wheelock, III, USA, has been designated as Dir., Policy Planning Staff, Office of Dep. Asst. Secretary of Defense (Planning & North Atlantic Affairs), Office of Asst. Secretary of Defense (International Security Affairs).

Capt. Raymond S. Sullivan, USN, has been named Dir., Defense Contract Administration Service Region, St. Louis, Mo.

The Military Traffic Management and Terminal Service (MTMTS), Washington, D.C., has announced the following assignments: **Capt. Francis S. Grubb,** USN, Dir. of Freight Traffic; **Col. Homer L. Sellers Jr.,** USA, Dir. of Terminals and Installations; **Col. Glen F. Petrie,** USA, Office of Comptroller and Programs. MTMTS also announces the retirement of **Col. Charles B. Claypool,** USA, former Dir. of Terminals and Installations and **Col. Armour S. Armstrong,** USA, former Dir. of Freight Traffic.

Col. Clarence J. Douglas Jr., USAF, has been assigned as Asst. to the Dir. for Programs Control, Defense Communications Planning Group, Defense Communications Agency.

Col. Jacksel M. Broughton, USAF, and **Col. Victor N. Cabas,** USAF, have been assigned as Air Force members, Weapons Systems Evaluation Group, Office of the Secretary of Defense.

Col. Leo G. Fradenburg, USAF, has been named Dep. Dir., Education Programs and Management Training, Office of the Dep. Asst. Secretary of Defense (Manpower).

New assignments in the Office of Asst. Secretary of Defense (Public Affairs) are: **Col. Jessie E. Stay,** USAF, Dep. Dir. of Defense Information; **Col. George F. Hamel,** USA, Chief, Veterans & Civic National Organizations Div., Directorate for Community Relations; **Col. Thompson M. Colkitt,** USA, Chief, Army Div., Directorate for Security Review.

DEPARTMENT OF THE ARMY

Maj. Gen. Frederick J. Clarke has been assigned as Dep. Chief of Engineers, Office of the Chief of Engineers, Washington, D.C. **Maj. Gen. Robert F. Seedlock** replaces Gen. Clarke in the triple role of Commanding General, Army Engineer Center; Commandant, Army Engineer School; and as Commanding General, Fort Belvoir, Va. **Brig. Gen. A. P. Rollins Jr.,** has been named Dir. of Military Construction, Army Corps of Engineers, the position formerly held by Gen. Seedlock.

Brig. Gen. Joyce B. James has been assigned as the new Dep. Commanding General, Strategic Communications Command, succeeding **Brig. Gen. Walter B. Bess,** who retired.

Dr. William Van Royen heads the new Environmental Sciences Div. of the Army Research Office-Durham, N.C.

Col. George H. McBride, Project Manager of the Hawk air defense missile system has been nominated for promotion to the rank of brigadier general.

Col. Nils M. Bengtson, who has just returned from a year in Vietnam, has been assigned as Dir., Research & Development, Army Missile Command, Redstone Arsenal, Ala.

Col. Delbert L. Bristol has assumed duties as Dep. Commander, Army Aviation Materiel Command, St. Louis, Mo.

Col. Eugene B. Datres has been named Dep. Commander, Army Satellite Communications Agency, Fort Monmouth, N.J.

Col. George H. Russell has been appointed as Dep. Dir. of Developments, Office of the Chief of Research & Development, Department of the Army.

Col. William W. Stone Jr. has relieved **Col. James H. Batte,** as Commanding Officer, Edgewood Arsenal, Md.

Lt. Col. Donald H. Steenburn has been assigned duty as Chief of the Chaparral Management Office, Army Missile Command, Redstone Arsenal, Ala.

DEPARTMENT OF THE NAVY

RAdm. Lewis C. Coxe has been reassigned from duty as Commander South Western Area, Naval Facilities Engineering Command, to the position of Dep. Commander for Acquisition, Naval Facilities Engineering Command, Washington, D.C.

Capt. Paul J. Hartley Jr. has been assigned to the Anti-Submarine Warfare System Projects Office in Washington, D.C.

DEPARTMENT OF THE AIR FORCE

J. William Doolittle has been appointed as General Counsel of the Air Force succeeding **Stephen N. Shulman** who has become Chairman of the Equal Employment Opportunity Commission.

Brig. Gen. Ralph G. Taylor Jr., is now serving as Commander, USAF Tactical Fighter Weapons Center, Nellis AFB, Nev.

Donald R. Eastman Jr. has been appointed as Technical Advisor to the Commander of the Arnold Engineering Development Center, Tenn.

Col. Elmer Torgesen has been assigned as Dir., Category III Test Management, 407L Program, Tactical Air Warfare Center, Eglin AFB, Fla.

Col. Alfred D. Blue has been assigned as Chief, Electronics Div., Office of Dep. Chief of Staff (Research and Development), Directorate of Science and Technology, Air Force headquarters.

Col. James O. Frankosky has been assigned as Dep. Dir. for Strategic and Defense Forces, Office of Dep. Chief of Staff (Research and Development), Directorate of Operational Requirements and Development Plans, Air Force headquarters.

Col. John McCorkle, Dir. of Materiel Management since May 1965, has been named Dep. Commander, Mobile Air Materiel Area, Brookley AFB, Ala.

New assignments in the Air Force Systems Command are: **Col Robert A. Duffy,** Dep. Dir., Air Force Avionics Laboratory, Research and Technology Div., Wright-Patterson AFB, Ohio; **Col. David S. Mellish,** Dir., Air Force Weapons Effectiveness Testing, Air Proving Ground Center, Eglin AFB, Fla.; **Col. William P. Lemme,** Air Force Plant Representative, Boeing Co., Air Force Contract Management Div., Wichita, Kan.; **Col. Calvin W. Fite,** Dep. for Limited War, Aeronautical Systems Div., Wright-Patterson AFB, Ohio; **Marc P. Dunnam,** Dep. Dir., Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio.

SECRETA

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OFFICE OF PROGRAM APPRAISAL

RADM THOMAS D DAVIES (Dir)	4D730	79396
Dr James R Larkin (Dep Dir) and	4D730	79396
(Dep For Systems Analysis)		79152
EXEC ASST FOR DIR AND DEP DIR		
CAPT John D Stulllebeem	4D730	79396
COL James P Rathbun USMC (Dep for USMC Matters)	4D725	75244

OFFICE OF INFORMATION

RADM H L MILLER (Chief of Information)	4C719	77391
CAPT Pickett Lumpkin (Deputy Chief of Information)	4C727	76724

OFFICE OF LEGISLATIVE AFFAIRS

RADM K L VETH (Chief)	5C760	77146
DEPUTY CHIEF		
CAPT Lloyd V Young	5C760	77146

OFFICE OF THE GENERAL COUNSEL

MR MERITT H STEGER (Gen Counsel)	2034	61296

ASSISTANT SECRETARY OF THE NAVY
(FINANCIAL MANAGEMENT)

HON CHARLES F BAIRD (Comptroller)	4E748	72325
CAPT Eugene C Kenyon Jr (The Executive Assistant and Naval Aide)	4E748	72325

ASSISTANT SECRETARY OF THE NAVY
(RESEARCH & DEVELOPMENT)

HON ROBERT A FROSCH	4E736	56315
CAPT Kent L Lee (The Executive Assistant and Naval Aide)	4E736	72674

OFFICE OF THE COMPTROLLER

RADM PAUL MASTERTON (Dep Comp)		4E764	53377
COL Wm R Bonner USMC (Asst for Marcorps Matters: Asst for Admin)		4E774	73067
(Vacant) (Asst for Policy Coordination)		4E774	77170
CAPT Wm A Racette USN (Asst for Financial Management Development)		4E764	73566
COUNSEL			
Dr Lawrence E Chermak		4E761	56436
CONTRACT FINANCING			
Mr John B Plott (Dir for)		2C342	77153
MANAGEMENT EVALUATION			
Mr B W Jamison (Asst for)		5B728	74580
DIRECTOR OF BUDGET & REPORTS			
RADM E E Grimm		4E782	77105
DIRECTOR OF FINANCIAL SERVICES			
RADM H L Beardsley	Arlx	2034	42681
AUDITOR GENERAL			
CAPT E K Auerbach (SC)	Arlx	2335	41502

OFFICE OF NAVAL RESEARCH
(Main Navy)

RADM J K LEYDON (Chief)	0449	64911
CAPT B C Byrnside (Dep & Asst Chief)	0449	62525
Dr P King (Dep & Chief Scientist)	0445	64356
ASST CHIEF FOR PATENTS		
CAPT J C Davis	4247	61100
ASST CHIEF FOR RESEARCH		
CAPT L B Melson	0401	64049
CIVILIAN PERSONNEL & SERVICE DIV		
Mr E McCrensky (Dir)	0433	63542
PROCUREMENT SERVICES		
Mr E P Bledsoe (Dir)	4121	65321
MILITARY SERVICES DIV		
CAPT W R Hunnicutt (Dir)	0434	66016
TRAINING DEVICE CENTER LIAISON OFFICE		
Mr J B Jennison	4234	65338

HEADQUARTERS, U S MARINE CORPS
COMMANDANT OF THE MARINE CORPS (Arlx)

GEN WALLACE M GREENE JR USMC	2004	42500
COL F C LaHue USMC (Military Secretary)	2004	42501

ASSISTANT COMMANDANT

LTGEN R C MANGRUM USMC	2001	41201
MAJ J R Love USMC (Administrative Assistant)	2001	41202

OFFICE OF THE C

CHIEF OF

ADM D L McDONALD
CAPT J H King Jr
(Exec Asst & Sr A

VICE CHIEF

ADM H RIVERO JR
CAPT W E Donnelly
(Exec Asst & Sr A

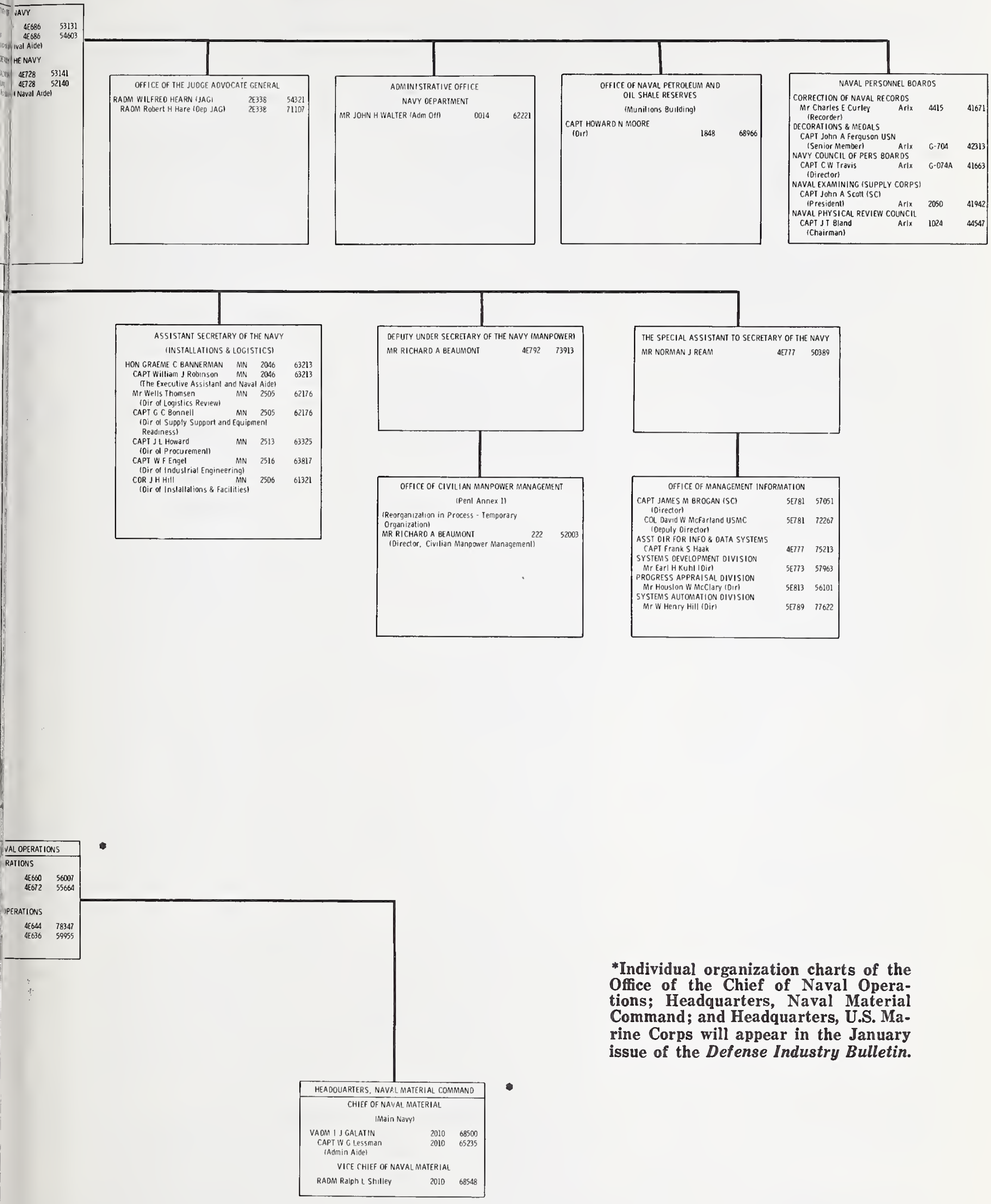
BUREAU OF NAVAL PERSONNEL
(Arlx)

VADM B J SEMMES JR. (Chief of Naval Personnel)	2072	41101
CDR H J Matthews Jr (Executive Assistant & Senior Aide)	2075	42340

BUREAU OF MEDICINE & SURGERY
(Potomac Annex)

VADM R B BROWN (MC) (Chief) (Surgeon General)	1112	62277
DEPUTY CHIEF OF BUREAU		
RADM R O Canada Jr (MC)	1112	62278

ATIONAL POSITIONS IN THE NAVY DEPARTMENT



NAVY		
	4E686	53131
	4E686	54603
ival Aide)		
HE NAVY		
	4E728	53141
	4E728	52140
(Naval Aide)		

OFFICE OF THE JUDGE ADVOCATE GENERAL

RADM WILFRED HEARN (JAG)	2E338	54321
RADM Robert H Hare (Dep JAG)	2E338	71107

ADMINISTRATIVE OFFICE
NAVY DEPARTMENT

MR JOHN H WALTER (Adm Off)	0014	62221

OFFICE OF NAVAL PETROLEUM AND OIL SHALE RESERVES
(Munitions Building)

CAPT HOWARD N MOORE (Dir)	1848	68966

NAVAL PERSONNEL BOARDS

CORRECTION OF NAVAL RECORDS			
Mr Charles E Curley (Recorder)	Arlx	4415	41671
DECORATIONS & MEDALS			
CAPT John A Ferguson USN (Senior Member)	Arlx	G-704	42313
NAVY COUNCIL OF PERS BOARDS			
CAPT C W Travis (Director)	Arlx	G-074A	41663
NAVAL EXAMINING (SUPPLY CORPS)			
CAPT John A Scott (SC) (President)	Arlx	2050	41942
NAVAL PHYSICAL REVIEW COUNCIL			
CAPT J T Bland (Chairman)	Arlx	1024	44547

ASSISTANT SECRETARY OF THE NAVY
(INSTALLATIONS & LOGISTICS)

HON GRAEME C BANNERMAN	MN	2046	63213
CAPT William J Robinson (The Executive Assistant and Naval Aide)	MN	2046	63213
Mr Wells Thomsen (Dir of Logistics Review)	MN	2505	62176
CAPT G C Bonnell (Dir of Supply Support and Equipment Readiness)	MN	2505	62176
CAPT J L Howard (Dir of Procurement)	MN	2513	63325
CAPT W F Engel (Dir of Industrial Engineering)	MN	2516	63817
CDR J H Hill (Dir of Installations & Facilities)	MN	2506	61321

DEPUTY UNDER SECRETARY OF THE NAVY (MANPOWER)

MR RICHARD A BEAUMONT	4E792	73913

OFFICE OF CIVILIAN MANPOWER MANAGEMENT
(Pent Annex 1)

(Reorganization in Process - Temporary Organization)

MR RICHARD A BEAUMONT (Director, Civilian Manpower Management)	222	52003

THE SPECIAL ASSISTANT TO SECRETARY OF THE NAVY

MR NORMAN J REAM	4E777	50389

OFFICE OF MANAGEMENT INFORMATION

CAPT JAMES M BROGAN (SC) (Director)	5E781	57051
COL David W McFarland USMC (Deputy Director)	5E781	72267
ASST DIR FOR INFO & DATA SYSTEMS		
CAPT Frank S Haak	4E777	75213
SYSTEMS DEVELOPMENT DIVISION		
Mr Earl H Kuhl (Dir)	5E773	57963
PROGRESS APPRAISAL DIVISION		
Mr Houston W McClary (Dir)	5E813	56101
SYSTEMS AUTOMATION DIVISION		
Mr W Henry Hill (Dir)	5E789	77622

VAL OPERATIONS ●

RATIONS		
	4E660	56007
	4E672	55664
PERATIONS		
	4E644	78347
	4E636	59955

HEADQUARTERS, NAVAL MATERIAL COMMAND ●

CHIEF OF NAVAL MATERIAL
(Main Navy)

VADM I J GALATIN	2010	68500
CAPT W G Lessman (Admin Aide)	2010	65235

VICE CHIEF OF NAVAL MATERIAL

RADM Ralph L Shilley	2010	68548

Individual organization charts of the Office of the Chief of Naval Operations; Headquarters, Naval Material Command; and Headquarters, U.S. Marine Corps will appear in the January issue of the *Defense Industry Bulletin.

Top 100 Defense Contractors for FY 1966 Announced

Top 100 Companies and Their Subsidiary Corporations Listed According to Net Value of Military Prime Contract Awards Fiscal Year 1966

(July 1, 1965—June 30, 1966)

The 100 companies which together with their subsidiaries received the largest dollar volume of military prime contracts of $10,000 or more in FY 1966 accounted for 63.8 percent of the U.S. total. This was 5.1 percentage points below the 68.9 percent obtained by the top 100 companies in FY 1965, and was the lowest percentage for the top 100 companies since reporting was initiated in FY 1957.

In FY 1966 awards to U.S. companies for work at home and overseas increased 38.7 percent to $33,532.6 million and the 100-company total increased 28.4 percent to $21,400.8 million. The value of $40.2 million for the company in the 100th position on the list for the current fiscal year is $16 million higher than the 100th company figure in FY 1965.

The rate of increase in FY 1966 for awards to the 100 companies lagged 10 percent behind that for total awards. At the same time small business firms increased their share of the total from 19.6 percent in FY 1965 to 21.4 percent in FY 1966.

Rank	Company	Millions of Dollars
	U. S. Total[a]	$33,532.6
	Total: 100 companies and their subsidiaries[b]	21,400.8
1.	Lockheed Aircraft Corp.	1,525.6
	Lockheed Shipbuilding & Construction Co.	5.4
	Total	1,531.0
2.	General Electric Co.	1,187.0
3.	United Aircraft Corp.	1,138.7
4.	General Dynamics Corp.	1,133.3
	Stromberg-Carlson Corp.	2.6
	United Electric Coal Co.	0.1
	Total	1,136.0
5.	Boeing Co.	914.5
6.	McDonnell Aircraft Corp.	692.3
	Conductron Corp.	7.8
	Hycon Mfg. Co.	17.5
	Tridea Electronics, Inc.	4.6
	Total	722.2
7.	American Telephone & Telegraph Co.	153.2
	Bell Tel. Co. of Pa.	[c]
	Chesapeake & Potomac Tel. Companies	7.3
	Mountain States Tel & Tel. Co.	1.6
	New England Tel. & Tel. Co.	0.6
	New Jersey Bell Tel. Co.	0.4
	New York Telephone Co.	0.2
	Northwestern Bell Tel. Co.	0.4
	Ohio Bell Telephone Co.	0.5
	Pacific Northwest Bell Tel. Co.	0.2
	Pacific Tel. & Tel. Co.	0.6
	Southern Bell Tel. & Tel. Co.	2.5
	Southwestern Bell Tel. Co.	0.9
	Teletype Corp.	18.0
	Western Electric Co., Inc.	485.7
	Total	672.1
8.	Textron, Inc.	15.4
	Accessory Products Corp.	[c]
	Bell Aerospace Corp.	532.3
	Cleveland Metal Abrasive Co.	0.1
	Delmo Victor Co.	[c]
	Durham Mfg. Co.	[c]
	Erie Tool Works	0.9
	Jones & Lamson Machine Co.	[c]
	Nuclear Metals, Inc.	[c]
	Sheaffer (W. A.) Pen Co.	[c]
	Textron Electronics, Inc.	1.5
	Textron Oregon, Inc.	4.2
	Townsend Co.	0.4
	Total	554.8
9.	Raymond International, Inc.; Morrison-Knudsen Co., Inc.; Brown & Root, Inc.; and J. A. Jones Construction Co.	547.9
10.	North American Aviation, Inc.	520.4
11.	General Motors Corp.	508.0
12.	Avco Corp.	506.0
13.	Kaiser Industries Corp.	1.0
	Kaiser Aerospace & Electronics Corp.	3.9
	Kaiser Jeep Corp.	358.4
	Kaiser Steel Corp.	42.7
	National Steel & Shipbuilding Co.	35.4
	Total	441.4
14.	Ford Motor Co.	91.7
	Philco Corp.	347.9
	Total	439.6
15.	Sperry Rand Corp.	426.8
16.	Raytheon Co.	356.7
	Amana Refrigeration, Inc.	[c]
	Dage-Bell Corp.	0.2
	Machlett Laboratories, Inc.	10.7
	Micro State Electronics Corp.	0.4
	Penta Laboratories, Inc.	0.5
	Total	368.5
17.	Westinghouse Electric Corp.	343.1
	Hagan Controls Corp.	0.1
	Thermo King Corp.	5.5
	Total	348.7
18.	Martin-Marietta Corp.	316.8
	Bunker-Ramo Corp.	20.6
	Bunker-Ramo Eastern Technical Center, Inc.	0.4
	Total	337.8
19.	Hughes Aircraft Co.	336.6
20.	General Tire & Rubber Co.	12.6
	Aerojet-Delft Corp.	0.8
	Aerojet-General Corp.	285.5
	Aerojet-General Nucleonics	1.0
	Batesville Mfg. Co.	18.4
	Fleetwood Corp.	[c]
	General Tire International Co.	0.2
	Space Electronics Corp.	[c]
	Space General Corp.	7.8
	Total	327.3
21.	Grumman Aircraft Engineering Corp.	322.9
22.	Ling-Temco-Vought, Inc.	259.0
	Continental Electronics Mfg. Co.	5.9
	Continental Electronics Systems, Inc.	0.5
	Kentron Hawaii, Ltd.	4.9
	LTV Electrosystems, Inc.	39.2
	LTV Ling Altec, Inc.	0.3
	OKonite Co.	1.0
	Total	310.8
23.	Bendix Corp.	276.1
	Beck-Lee Corp.	[c]
	Bendix Field Engineering Corp.	4.7
	Bendix-Westinghouse Automotive Air Brake Co.	0.4
	Dage Electric Co., Inc.	[c]
	Microwave Devices, Inc.	[c]
	Sheffield Corp.	0.6
	Total	281.8
24.	Douglas Aircraft Co.	278.9
25.	Northrop Corp.	182.7
	Northrop Carolina, Inc.	0.3
	Page Communications Engineers, Inc.	93.0
	Total	276.0

Rank	Company	Millions of Dollars
26.	Honeywell, Inc.	250.6
27.	Collins Radio Co.	245.3
28.	Radio Corp. of America	242.1
	RCA Defense Electronics Corp.	0.3
	Total	242.4
29.	International Telephone & Telegraph Corp.	120.3
	Barton Instrument Corp.	0.1
	Documat, Inc.	0.4
	Federal Electric Corp.	57.6
	ITT Gilfillan, Inc.	39.2
	ITT Technical Services, Inc.	1.5
	ITT Terryphone Corp.	0.2
	Jennings Radio Mfg. Corp.	0.5
	Total	219.8
30.	Litton Industries, Inc.	13.2
	Airtron, Inc.	0.1
	Analogue Controls, Inc.	[c]
	Clifton Precision Products Co., Inc.	0.2
	Ingalls Shipbuilding Corp.	46.9
	Litton Precision Products, Inc.	6.6
	Litton Systems, Inc.	152.0
	Mellonics Systems Development, Inc.	0.1
	Monroe Calculating Machine Co., Inc.	0.1
	Monroe Intl., Inc.	0.1
	P S Corp.	[c]
	U.S. Engineering Co., Inc.	0.1
	Total	219.4
31.	Standard Oil Co. (New Jersey)	0.0
	American Cryogenics, Inc.	1.4
	Esso International, Inc.	129.3
	Esso Research & Engineering Co.	1.5
	Esso Standard Eastern, Inc.	17.2
	Esso Standard Oil Co. (Puerto Rico)	1.2
	Humble Oil & Refining Co.	63.4
	Total	214.0
32.	Ryan Aeronautical Co.	69.7
	Continental Aviation & Engineering Corp.	29.5
	Continental Motors Corp.	98.6
	Wisconsin Motor Corp.	1.8
	Total	199.6
33.	General Telephone & Electronics Corp.	0.0
	Automatic Electric Co.	5.6
	Automatic Electric Sales Corp.	5.1
	California Water & Tel. Co.	0.1
	General Telephone & Electronics Laboratories, Inc.	0.1
	General Tel. Co. of Fla.	[c]
	General Telephone Co. of Puerto Rico	
	General Telephone Co. of the Southeast	0.1
	Lenkurt Electric Co., Inc.	4.1
	Sylvania Electric Products, Inc.	181.3
	West Coast Tel. Co.	[c]
	Total	196.4
34.	International Business Machines Corp.	180.8
	Science Research Associates	0.1
	Service Bureau Corp.	0.7
	Total	181.6
35.	Olin Mathieson Chemical Corp.	173.0
36.	Pan American World Airways, Inc.	170.0
	Pan American Grace Airways	[c]
	Total	170.0
37.	FMC Corp.	162.5
	Gunderson Bros. Engineering Corp.	0.1
	Total	162.6
38.	du Pont (E. I.) de Nemours & Co.	20.4
	Remington Arms Co., Inc.	140.7
	Total	161.1
39.	Chrysler Corp.	150.2
40.	Standard Oil Co. (Calif.)	84.1
	California Oil Co.	0.8
	Caltex Oil Products Co.[d]	39.7
	Caltex Philippines, Inc.[d]	0.1
	Chevron Asphalt Co.	0.1
	Chevron Chemical Co.	0.3
	Chevron Oil Co.	[c]
	Community Oil Co., Inc.	0.3
	Hoffman Fuel Co., Inc.	[c]
	Independent Gasoline & Oil Co. of Rochester	[c]
	Standard Oil Co. of Kentucky	10.9
	Standard Oil Co. of Texas	4.8
	Total	141.1
41.	Goodyear Tire & Rubber Co.	50.9
	Goodyear Aerospace Corp.	78.5
	Goodyear International Co.	0.1
	Kelly-Springfield Tire Co.	[c]
	Lee Tire & Rubber Co.	0.1
	Motor Wheel Corp.	0.9
	Total	130.5
42.	Hercules, Inc.	118.6
	Haveg Industries, Inc.	1.3
	M H D Research, Inc.	0.2
	Total	120.1
43.	General Precision Equipment Corp.	0.0
	Controls Co. of America	0.3
	General Precision Decca Systems, Inc.	[c]
	General Precision, Inc.	108.1
	Graflex, Inc.	1.3
	National Theatre Supply Co.	[c]
	Strong Electric Corp.	1.8
	Tele-Signal Corp.	5.9
	Total	117.4
44.	Thiokol Chemical Corp.	110.7
45.	Norris-Thermador Corp.	110.0
	Fyr-Fyter Co.	0.6
	Total	110.6
46.	Texaco, Inc.	21.6
	Caltex Oil Products Co.[d]	39.7
	Caltex Philippines, Inc.[d]	0.1
	Jefferson Chemical Co., Inc.	0.4
	Paragon Oil Co.	1.1
	Texaco Caribbean, Inc.	0.1
	Texaco Experiment, Inc.	3.2
	Texaco Export, Inc.	38.3
	Texaco Puerto Rico, Inc.	0.4
	Texaco Trinidad, Inc.	0.1
	White Fuel Co., Inc.	0.7
	Total	105.7
47.	Signal Oil and Gas Co.	5.9
	Garrett Corp.	97.9
	Southland Oil Corp.	0.5
	Space Petroleum Corp.	1.1
	Total	105.4
48.	T R W, Inc.	103.6
49.	Lear-Siegler, Inc.	89.0
	American Avitron, Inc.	0.4
	Astek Instrument Corp.	0.4
	Cimron Corp.	0.1
	Hokanson, (C. G.) Co., Inc.	0.6
	Lear-Siegler Service, Inc.	7.5
	Total	98.0
50.	Mobil Oil Corp.	97.7
51.	Eastman Kodak Co.	94.2
	Eastman Kodak Stores, Inc.	1.6
	Recordak Corp.	0.7
	Total	96.5
52.	Bethlehem Steel Corp.	89.9
	Bethlehem Steel Export Corp.	0.9
	Calmar Steamship Corp.	1.3
	Total	92.1

Rank	Company	Millions of Dollars
53.	Curtiss-Wright Corp.	91.1
54.	Asiatic Petroleum Corp.	88.0
55.	Colt Industries, Inc.	4.5
	Chandler Evans, Inc.	12.1
	Colt's Inc.	0.1
	Colt's Patent Fire Arms Mfg. Co., Inc.	63.4
	Fairbanks Morse, Inc.	4.6
	Pratt & Whitney, Inc.	1.9
	Total	86.6
56.	Magnavox Co.	83.5
57.	Harvey Aluminum, Inc.	32.6
	Harvey Aluminum Sales, Inc.	49.8
	Total	82.4
58.	Aerospace Corp.	80.4
59.	Fairchild Hiller Corp.	80.1
60.	International Harvester Co.	73.1
	Hough (Frank G.) Co.	1.7
	MacLeod & Co.	2.8
	Total	77.6
61.	Sanders Associates, Inc.	77.1
62.	Stevens (J. P.) & Co., Inc.	75.8
63.	Firestone Tire & Rubber Co.	73.9
	Dayton Tire & Rubber Co.	0.6
	Total	74.5
64.	United States Rubber Co.	74.5
	Masland Duraleather Co.	[c]
	U.S. Rubber International Corp.	[c]
	Total	74.5
65.	United States Steel Corp.	69.5
	Reactive Metals, Inc.	[c]
	Total	69.5
66.	American Electric, Inc.	68.6
67.	Chamberlain Corp.	67.4
68.	Teledyne, Inc.	62.3
69.	Hupp Corp.	61.6
70.	Condec Corp.	56.6
	Consolidated Avionics Corp.	[c]
	Consolidated Controls Corp.	0.4
	Total	57.0
71.	American Machine & Foundry Co.	55.4
	Cuno Engineering Corp.	0.7
	Voit (W. J.) Rubber Corp.	0.2
	Total	56.3
72.	Motorola, Inc.	50.0
	Motorola Communications & Electronics, Inc.	5.0
	Motorola Overseas Corp.	[c]
	Total	55.0
73.	Western Union Telegraph Co.	54.9
74.	Day & Zimmerman, Inc.	54.1
75.	Sverdrup & Parcel, Inc.	[c]
	ARO, Inc.	52.3
	Total	52.3
76.	Union Carbide Corp.	48.5
	Englander Co., Inc.	0.1
	Korad Corp.	1.1
	Ocean Systems, Inc.	2.1
	Union Carbide Internat'l., Inc.	[c]
	Total	51.8
77.	Newport News Shipbuilding & Dry Dock Co.	51.5
78.	Mass. Institute of Tech.	50.7
79.	Vitro Corp. of America	49.3
	Vitro Minerals & Mining Corp.	1.2
	Total	50.5
80.	Burlington Industries, Inc.	36.4
	Cleveland Woolens	2.4
	Erwin Mills, Inc.	11.7
	Klopman Mills, Inc.	[c]
	Total	50.5
81.	Johns Hopkins University	50.5
82.	Caterpillar Tractor Co.	47.0
	Towmotor Corp.	2.5
	Total	49.5
83.	General Time Corp.	48.0
84.	Texas Instruments, Inc.	47.2
	Metals & Controls, Inc.	[c]
	Total	47.2
85.	National Presto Industries	45.5
86.	Westinghouse Air Brake Co.	1.2
	Failing (George E.) Co.	0.3
	Le Tourneau-Westinghouse Co.	16.2
	Melpar, Inc.	18.0
	Wilcox Electric Co., Inc.	8.3
	Total	44.0
87.	Flying Tiger Line, Inc.	43.6
88.	American Manufacturing Co. of Texas	43.4
89.	Emerson Electric Co.	42.8
	Rantec Corp.	0.1
	Total	42.9
90.	Atlantic Research Corp.	41.7
	Northeastern Engineering, Inc.	0.1
	Total	41.8
91.	Clark Equipment Co.	41.7
92.	Universal American Corp.	1.2
	Amron Corp.	40.4
	Von Kohorn-Universal Corp.	[c]
	Total	41.6
93.	Control Data Corp.	35.8
	Control Corp.	0.1
	Data Display, Inc.	[c]
	Datatrol Corp.	0.3
	Rabinow Electronics, Inc.	0.2
94.	System Development Corp.	40.7
95.	Burroughs Corp.	40.4
	Burroughs Control Corp.	0.3
	Total	40.7
96.	Hayes International Corp.	40.7
97.	Bowen-McLaughlin-York, Inc.	40.5
98.	Dow Chemical Co.	39.6
	Dow Corning Corp.	0.6
	Total	40.2
99.	Borg-Warner Corp.	34.4
	Morse Chain Co.	[c]
	York Corp.	5.8
	Total	40.2
100.	Continental Oil Co.	32.3
	American Agricultural Chemical Co.	[c]
	Douglas Oil Co. of Calif.	6.8
	Western Oil & Fuel Co.	1.1
	Total	40.2

Footnotes

[a] Net value of new procurement actions minus cancellations, terminations and other credit transactions. The data include debit and credit procurement actions of $10,000 or more, under military supply, service and construction contracts for work in the United States plus awards to listed companies and other U.S. companies for work overseas.

Procurement actions include definitive contracts, the obligated portions of letter contracts, purchase orders, job orders, task orders, delivery orders, any other orders against existing contracts. The data do not include that part of indefinite quantity contracts that have not been translated into specific orders on business firms, nor do they include purchase commitments or pending cancellations that have not yet become mutually binding agreements between the Government and the company.

[b] The assignment of subsidiaries to parent companies is based on stock ownership of 50 percent or more by the parent company, as indicated by data published in standard industrial reference sources. The company totals do not include contracts made by other U.S. Government agencies and financed with DOD funds, or contracts awarded in foreign nations through their respective governments. The company names and corporate structures are those in effect as of June 30, 1966. Only those subsidiaries are shown for which procurement actions have been reported.

[c] Less than $50,000.

[d] Stock ownership is equally divided between Standard Oil Co. of California and Texaco, Inc.; half of the total of military awards is shown under each of the parent companies.

MEETINGS AND SYMPOSIA

JANUARY

Mission of Navy Laboratories—Washington Area Briefing (Classified), at Naval Research Laboratory, Washington, D.C., Jan. 19. Sponsor: Washington Chapter of American Ordnance Assn. Contact: J. T. Ticer, Atlantic Research Corp., Alexandria, Va.

Fifth **Aerospace Sciences** Meeting, Jan. 23–25, at Statler-Hilton Hotel, New York, N.Y. Sponsor: American Institute of Aeronautics and Astronautics. Contact: Jack Nielsen, General Chairman, P.O. Box 642, Los Altos, Calif. 94022.

Symposium on **Circuit Design by Computer,** Jan. 30–31, at New York University, Bronx, N.Y. Sponsor: Office of Naval Research. Contact: Cdr. D. D. Kilpatrick, USN, Office of Naval Research, Department of the Navy, Washington, D.C. 20360, (Area Code 202) OXford 6–3082.

Second Annual Symposium on **Non-Destructive Testing of Welds,** Jan. 30–Feb. 2, at Chicago, Ill. Sponsor: Illinois Institute of Technology. Contact: T. F. Drouillard, ITT Research Institute, 10 West 35th St., Chicago, Ill. 60616.

FEBRUARY

Winter Convention on **Aerospace and Electronic Systems,** Feb. 7–9, at International Hotel, Los Angeles, Calif. Sponsor: Institute of Electrical and Electronics Engineers (IEEE). Contact: IEEE, 345 East 47th St., New York, N.Y. 10017.

Institute of Navigation 1967 National Air Meeting on **Collision Avoidance,** Feb. 23–24, at Dayton, Ohio. Sponsor: Institute of Navigation. Contact: Capt. Ross E. Freeman, USN (Ret.), Executive Director, Institute of Navigation, Suite 912, 711 14th St., N.W., Washington, D.C. 20005, (Area Code 202) 783–3296.

Systems Effectiveness Conference, Feb. 28–March 1, at Statler-Hilton Hotel, Los Angeles, Calif. Sponsor: Electronic Industries Assn. Contact: Robert E. Redfern, Electronic Industries Assn., 2001 Eye Street, N.W., Washington, D.C. 20006

MARCH

Syposium on **Modern Optics,** March 22–24 (revised date), New York City. Sponsors: Air Force Office of Scientific Research, Office of Naval Research and Army Research Office. Contact: Lt. Col. E. P. Gaines Jr., (SREE), Air Force Office of Scientific Research, Tempo D, 4th and Independence Ave., S.W., Washington D.C. 20333, (Area Code 202) OXford 6–3671.

APRIL

Biomechanics Symposium, April 5–6, at Augustana College, Rock Island, Ill. Sponsors: Rock Island Army Arsenal, Army Weapons Command, Army Research Office-Durham and Augustana College. Contact: Prof. John E. Ekblad, Augustana College, Rock Island, Ill. 61201.

Annual **Frequency Control** Symposium, April 24–26, at the Shelburne Hotel, Atlantic City, N.J. Sponsor: Army Electronics Command. Contact: Director, Electronic Components Laboratory, Army Electronics Command, Attn: AMSEL–KL–SR (Mr. M. F. Timm), Fort Monmouth, N.J. 07703, (Area Code 201) 535–2826 or 535–1728

AMC Gets Instant Procurement Information Computer

A computer-equipped system which provides instant information on procurement actions throughout the Army Materiel Command (AMC) has been inaugurated at the Army Electronics Command, Fort Monmouth, N.J.

When in full operation the system, called Standard Work Ordering and Reporting Data System (SWORDS), will establish a data bank of contractual information at every AMC installation involved in providing or using work ordering service.

Another function of the system provides instant communication between all AMC elements and the Defense Contract Administration Services on daily procurement actions. Information on the actions can be fed into one installation's computer by magnetic tape or punch cards and be immediately available at the others.

Two New DCASO's Established

The Defense Supply Agency (DSA) has established new Defense Contract Administration Services Offices (DCASO's) in Orlando, Fla., and Huntsville, Ala.

A DCASO located at The Martin Co., P. O. Box 5837, Orlando, Fla. 32805, will administer contracts at the Martin plant. The Martin plant is currently producing on several major DOD systems including the Sprint, Walleye, Bullpup and Pershing weapon systems.

The Huntsville DCASO, located at 2109 W. Clinton St., Huntsville, Ala. 35805, will administer both National Aeronautics and Space Administration (NASA) and DOD contracts in the heavily industrialized area in and around Huntsville. NASA contracts will comprise the bulk of the new DCASO's contracts.

Both new offices are part of the Defense Contract Administration Services Region, Atlanta.

USAF Develops Tiny Image Storing Device

A device that theoretically could store an entire motion picture the size of "Gone With the Wind" on one crystal no bigger than a sugar cube has been developed by Air Force Systems Command bionics scientists at Wright-Patterson AFB, Ohio.

The experimental model uses a helium neon laser to bleach a photographic slide onto the purple-colored, potassium bromide crystal. By turning the crystal slightly, another image can be recorded. Incremental changes would permit storage of several hundred thousand items.

Air Force Avionics Laboratory, a unit of Systems Command's Research and Technology Division, developed the process which is officially called a Multiple Image Storage Device.

By removing the eyepiece from a microscope focused on 35mm slides stored on the crystal, images can be crudely displayed on a projection screen.

The device is basically one of several bionics-type endeavors to duplicate the high-density "packaging" of nature—typified in the human brain, which has about 10 billion neurons, or nerve cells.

Thus far only two dimensional slides of writing or objects have been bleached onto the crystal. Future experimentation will be directed toward storing three dimensional or hologram-type slides and improving the methods of removing slides from the crystal.

1966 Omnibus Act Authorizes Civil Works Projects

The Omnibus Rivers and Harbors and Flood Control Act of 1966 authorizes the Army Corps of Engineers to construct, modify, or otherwise participate in the provision of 42 flood control, navigation, water conservation and other water resources projects, having an estimated Federal cost of $670,235,000.

This includes 27 flood control (including multiple-purpose) projects at a cost of $645,352,000; 11 navigation projects at an estimated Federal cost of $17,872,000; and four beach erosion projects at an estimated Federal cost of $7,011,000. The act authorizes 12 surveys for flood control and allied purposes and two surveys in the interest of navigation and beach erosion control.

The new Omnibus Act also raises the yearly limit of $2,500,000 authorized by the Flood Control Act of 1960, as amended, for flood plain information studies and advice on flood plain management to $7,000,000.

A listing of new construction and other authorizations with description and estimated Federal cost, where appropriate, follows. The initials before the project descriptions indicate: N (navigation); FC (flood control); BE (beach erosion control); MP (multiple-purpose), and HFC (hurricane flood control).

(Legend. The sequence of the listing is as follows: 1. Location. 2. Description of project. 3. Dollar amount of Federal cost.)

ARKANSAS

Bayou Bartholomew. (FC) Levees and small reservoirs. $9,360,000.

CALIFORNIA

Klamath River. (FC) Levees for flood protection of Klamath and Klamath Glen. $2,460,000.

Pajaro River. (FC) Levees and channel improvements. $11,890,000.

Russian River. (FC) Reservoir at Knights Valley; diversion dam and pumping plant. $166,800,000.

San Diego (Sunset Cliffs). (BE) Shore protection works. $809,000.

Yuba River. (MP) Marysville Reservoir. $132,900,000.

CONNECTICUT

Pequonnock River Basin. (MP) Trumbull Reservoir. $5,000,000.

FLORIDA

Gulf County Canal. (N) Shallow draft channel. $477,000.

Mullet Key. (BE) Shore protection. $286,000.

Pinellas County. (BE) Shore protection works. $116,000.

St. Lucie Inlet. (N) Channel maintenance and navigation aids.

GEORGIA

Savannah River. (MP) Trotters Shoals Reservoir. $84,900,000.

IDAHO

Boise River and tributaries, vicinity of Boise. (FC) Cottonwood Creek and Stuart Gulch Reservoirs. $1,576,000.

IOWA

Mississippi River—Fort Madison Harbor. (N) Access channel and maneuvering area. $975,000.

KENTUCKY

Little Sandy River and Tygarts Creek. (MP) Kehoe Reservoir. $15,000,000.

Salt River. (MP) Taylorsville Reservoir. $24,800,000.

LOUISIANA

Ouachita River at Monroe. (FC) Authorize maximum flood protection Plan "B." $1,160,000.

Teche-Vermilion Basins. (FC) Diversion of water from Atchafalaya River to Teche-Vermilion basins. $5,100,000.

Baton Rouge. (FC) Bank revetment.

MASSACHUSETTS

North Nashua River Basin. (FC) Monoosnoc Brook, Nookagee, Whitmanville and Phillips Reservoirs; channel improvements. $15,816,000.

Sudbury River at Saxonville. (FC) Local flood protection. $1,300,000.

MICHIGAN

Cross Village Harbor. (N) Breakwaters, anchorage and maneuvering area, channel improvements, and recreational fishing facility. $723,000.

MISSISSIPPI

Biloxi River. (N) Channel deepening and widening. $753,000.

Pearl River. (N) Cutoffs and easement of bends in West Pearl River. $630,000.

MISSOURI

Meramec River. (FC) Pine Ford, Irondale and I-38 Reservoirs; angler use sites for recreational areas and facilities. $45,971,000.

Mississippi River-Agricultural Areas—Mile 195 to Mile 300 above Ohio River. (FC) Levees and pumping plants. $7,193,000.

NEW JERSEY

Newark Bay, Hackensack and Passaic Rivers. (N) Deep draft channel improvements and maneuvering areas for Newark Bay; shallow draft channel improvements for Hackensack River. $12,899,000.

NEW YORK

Red Creek, Monroe County. (FC) Local flood protection. $1,430,000.

NORTH CAROLINA

Beaufort Inlet to Bogue Inlet. (HFC) Dikes and drainage structures. $320,000.

Bogue Inlet to Moore Inlet. (HFC) Shore protection works for Topsail Beach and Surf City. $1,249,000.

Cape Fear River to North Carolina and South Carolina state line. (HFC) Shore protection works for Youpon, Long, Holden, Ocean Isle and Sunset Beaches. $12,310,000.

Mainland Areas, N.C. (HFC) Earthen dike with drainage and navigation structures. $2,048,000.

Ocracoke Inlet to Beaufort Inlet. (BE) Shore protection works. $5,800,000.

Carolina Beach Harbor. (N) Maintenance of harbor channels.

Southport Harbor. (N) Maintenance of channel turning basin for small boat harbor.

Outer Banks-Virginia state line to Hatteras Inlet. (HFC) Shore protection works for Kitty Hawk, Kill Devil Hills and Nags Head. $6,652,000.

OHIO

Conneaut Harbor. (N) Shallow draft navigation and recreational improvements. $495,000.

Maumee River at Ottawa. (FC) Local flood protection. $3,413,000.

PENNSYLVANIA

Elk Creek Harbor. (N) Shallow draft navigation and recreational improvements. $920,000.

TEXAS

Arkansas and Red Rivers, water quality control, Part I. (FC) Wichita River project to control natural

(Continued Inside Back Cover)

BIBLIOGRAPHY

The publications listed below may be obtained at the following addresses:

DOD Directives and Instructions:
Publication Distribution Branch
Office of the Secretary of Defense
Room 3B 200, The Pentagon
Washington, D.C. 20301

Defense Procurement Circulars:
Distribution is made automatically to subscribers of the Armed Services Procurement Regulation by the Government Printing Office Office.

Research Reports:
Authorized DOD contractors and grantees may obtain these documents without charge from:
Defense Documentation Center
Cameron Station
Alexandria, Va. 22314

Others may purchase these documents at the price indicated from:
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DOD Directives and Instructions

DOD Directive, 5160.57, "Electromagnetic Compatibility Analysis Center (ECAC)," Sept. 23, 1966. Prescribes the mission, functions, responsibilities, operational relationships, and the management arrangement for the joint DOD Electromagnetic Compatibility Analysis Center.

DOD Instruction 5210.51, "Security Classification Concerning Airborne Passive Scanning Infrared Imaging Systems," Oct. 25, 1966. Prescribes uniform standards and criteria for classifying information pertaining to certain airborne passive infrared imaging systems; levels of capability of such imaging systems at and below which operating data can be disclosed without jeopardizing national defense; and general guidance governing the issuance of specific classification guides for individual imaging systems.

DOD Instruction 5410.15, "Delineation of DOD Audio-Visual Public Affairs Responsibilities and Policies," Nov. 3, 1966. Delineates DOD responsibilities and policies on releasing DOD-generated audio-visual material to the public and furnishing assistance to non-Government agencies involved in the production of audio-visual materials insofar as they help sustain public understanding of DOD.

Defense Procurement Circulars

Defense Procurement Circular No. 49, Oct. 31, 1966. (1) North Carolina Sales and Use Tax Refunds Applicable to Construction Contracts. (2) Identification of Expenditures in the United States. (3) Equal Employment Opportunity. (4) Contractor Team Arrangements. (5) Organizational Conflicts of Interest. (6) List of Educational or Non-Profit Institutions With Approved Patent Policies.

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Geometrical Effects of Filament Twist on the Modulus and Strength of Graphite Fiber Reinforced Composites. Air Force Materials Laboratory, Sept. 1966, 18 p. Order No. AD–638 299. $1.

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Application of Computers to RF Circuit Design, Final Report. Applied Technology, Inc., Palo Alto, Calif., for the Army, Sept. 1966, 133 p. Order No. AD–637 600. $4.

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Micro-Notes, Information on Microelectronics for Navy Equipment. Naval Air Systems Command, Sept. 1966, 86 p. AD–639 091. $3.

A Temperature Compensating Preamplifier for Driving Long Coaxial Lines in Scintillation Spectroscopy Applications. Naval Radiological Defense Laboratory, San Francisco, Calif., Aug. 1966, 38 p. Order No. AD–635 882. $2.

The Preparation of Oriented Single Crystal Spheres of Intermetallic Compounds Between the Rare Earth and Iron Group Metals. Perkin-Elmer Corp., Norwalk, Conn., for the Air Force, Sept. 1966, 32 p. Order No. AD–637 803. $2.

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U.S.-German Cooperation Includes Field of Logistics

by
Hugh J. Gownley

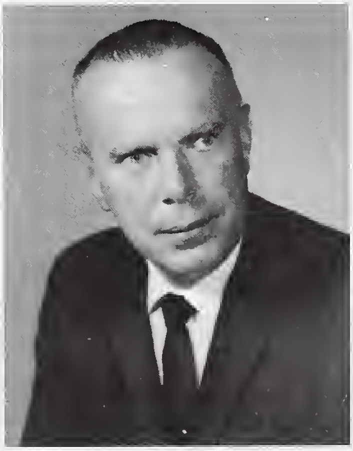
From the early days of the reactivation and buildup of the modern German armed forces in 1956, discerning defense authorities, both German and American, became acutely aware of the importance of cooperative logistics to support, on a sustained basis, the men and weapons associated with the buildup of viable North Atlantic Treaty Organization (NATO) defense forces. As the NATO armed forces grew, many German and American officials became painfully aware that, while money could be provided to buy modern and sophisticated weapons, it was not as easy to provide for the support necessary to maintain an operationally ready force.

In the spring of 1961, with the knowledge that international logistics cooperation was not a reality, DOD officials approached the Ministry of Defense of the Federal Republic of Germany (FRG) and proposed that the United States provide logistics assistance to the Federal Republic. This proposal was made because U.S. military authorities recognized that lack of modern equipment and logistics support for German divisions fighting alongside U.S. divisions created a situation which was not militarily acceptable to either Germany or the United States.

The proposal was found to be most interesting to the German government. During the spring and summer of 1961, therefore, a series of joint conferences was held to determine specifically the kinds of logistics support that the Federal Republic of Germany needed and which the United States could provide. The work accomplished in these joint conferences led ultimately to the first Cooperative Logistics Agreement between Germany and the United States in October 1961. Through this agreement, the United States was to provide logistics assistance in the fields of procurement services, depot supply support, depot maintenance, training, storage and provision of emergency medical services. The agreement was reaffirmed in September 1962 and in May 1964 by Secretary McNamara and Minister van Hassel. The latter agreement covered the years 1965–1966.

What has been accomplished by the aforementioned agreements is unique in military history. At no time in the past have two sovereign nations wedded their military logistics systems to the point where support is provided on an equal basis. To understand the real meaning of this cooperative support, however, one must look at some of the specific areas involved.

Supply Support. Supply support for most of the U.S.-produced major Army weapon systems in the German Army's inventory is accomplished through the U.S. Army supply system in the continental United States and in Europe. This means that German Army requisitions prepared on U.S. forms are dispatched electronically into the U.S. Army system and are processed in the same manner as requisitions from the U.S. Army units. Materiel to fill these requisitions is procured, shipped, stored and issued from U.S. Army depots, again in the same fashion as materiel is handled for U.S. Army units. There is no segregation of stock for German or American customers and in every respect German Army units enjoy the same degree of support as is given to American units of equal priority. Support for the German Navy and the German Air Force has been developed (although in lesser volume) along comparable lines. These significant statistics illustrate the past and future accomplishments in this area:



Hugh J. Gownley is Dep. for Management to the Dep. Asst. Secretary of Defense (International Logistics Negotiations), Office of Asst. Secretary of Defense (International Security Affairs). He also supervises the activities of the Federal Republic of Germany, European and Latin American Directorates.

- Line items of requisitions processed FY 1961–66: 181,441
- Line items of requisitions estimated FY 1967–70: over 200,000

Training Support. The need for adequate training space has been a continuing concern to the German armed forces. The United States has been sharing training time at German installations and has operated some 26 major training facilities in the United States for the German Army and Air Force. Some of the significant facts in this area are:

- Over 2,000 Air Force students have been trained in the United States in the last five years with many more to come.
- Almost 16,000 Army technical students were trained in the United States with 10,000 planned for the future.
- Over 3,000 Naval students were trained in the United States with 2,000 more planned for the future.
- Over 961 battalion weeks of training time was provided to the German Army at U.S. training areas in Europe with over 1,500 planned for the future.

Procurement Support. Another significant logistic service which the United States performs for the Federal Republic of Germany involves procurement support. The Germans have asked for this procurement assistance because they do not have the personnel to administer the very large volume of German defense materiel purchased in the United States. The kinds of procurement services, in addition to contract negotiation are: audit services, inspection, quality control, and the acquisition of appropriate publications or manuals. Some interesting statistics in this area include:

- Over 4,000 man years of procurement, audit, contract and other types of services have been provided.
- Over 3,000 man years are planned for the future.

Maintenance Support. U.S. Army depot maintenance facilities in Germany are now used to overhaul, repair and rebuild American equipment held by German forces. The maintenance requirements of the Germany Army are programmed in advance along with U.S. requirements so that German and U.S. equipment can be seen passing through the same overhaul line in a U.S. facility, receiving the same quality of repair and timely return to the users. Facts worth noting include the following:

- Over 50 major types of Army equipment are maintained by U.S. facilities for the German Army.
- Complete shipyard support is provided for German Naval destroyers of an American type.
- Almost 2,000,000 man hours of maintenance time has been provided to the German Army by U.S. forces.
- Over 2,500,000 man hours are planned for the future.

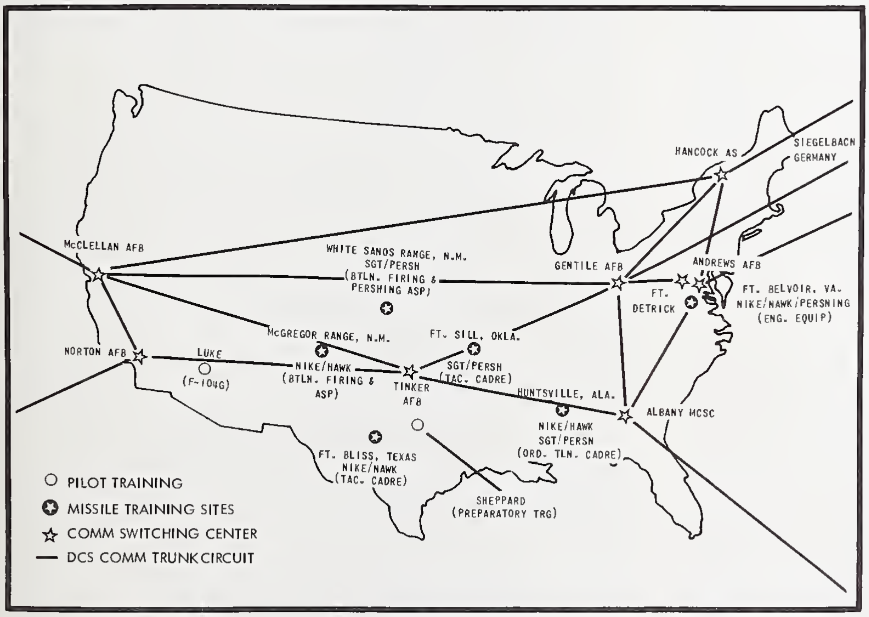
Storage, Administration and Training Space. A separate procedural arrangement has been instituted for the joint utilization of facilities belonging to the United States which can be put at the disposal of the German armed forces. Requirements expressed by the Federal Republic of Germany are reviewed by the U.S. European Command, available space is identified, offers and acceptances are exchanged with Germany, and specific agreements are then negotiated. A significant statistic in this area is:

- Over 500,000 square feet of space is shared with Germany at U.S. facilities in Europe.

Research and Development Cooperation. A cooperative research and development program, bringing together the top engineers and scientists of both countries, has been developed. This cooperation involved:

- Development of a new main battle tank for the 1970's with over $150 million of development cost shared by the two countries.
- Studies of vertical take-off and short take-off aircraft for the 1970's with the cost of these studies shared by both countries.
- Over 115 technical data exchange agreements by which the United States provides technical data to Germans on subjects covering military technology.

Today, in Germany, five U.S. divisions, together with 12 German divisions, constitute the principal NATO deterrent against any aggression from the East. This combined force is made significantly stronger by the support provided by the cooperative logistic system that has been developed during the past five years. Germany and the United States have shown that cooperation in logistics can work effectively—and all of NATO is the beneficiary of this successful endeavor.


HANCOCK AS
SIEGELBACN GERMANY
McCLELLAN AFB
WHITE SANOS RANGE, N.M. SGT/PERSH (BTLN. FIRING & PERSHING ASP)
GENTILE AFB
ANDREWS AFB
FT. DETRICK
FT. BELVOIR, VA. NIKE/NAWK/PERSNING (ENG. EQUIP)
McGREGOR RANGE, N.M. NIKE/HAWK (BTLN. FIRING & ASP)
FT. SILL, OKLA. SGT/PERSH (TAC. CADRE)
NORTON AFB
LUKE (F-104G)
TINKER AFB
HUNTSVILLE, ALA. NIKE/HAWK SGT/PERSN (ORD. TLN. CADRE)
ALBANY MCSC
FT. BLISS, TEXAS NIKE/NAWK (TAC. CADRE)
SHEPPARD (PREPARATORY TRG)
○ PILOT TRAINING
✪ MISSILE TRAINING SITES
☆ COMM SWITCHING CENTER
— DCS COMM TRUNKCIRCUIT

LOGISTICS COOPERATION WITH GERMANY IN THE UNITED STATES

Laser Memory Device Developed by USAF Scientists

Scientists of the Air Force Systems Command's Research & Technology Div. (RTD) have developed a laser beam device to serve as the "memory" for experimental electronic systems that could some day fly an aircraft or control satellite missions.

Called an Optical Maze Runner, it is one of several efforts in RTD's Air Force Avionics Laboratory at Wright-Patterson AFB, Ohio, to apply knowledge gained of living things to the solution of engineering problems. The maze runner is modeled after biological nerve patterns that store huge amounts of information for learning and decision.

In theory, it could be compared to a game of Parcheesi, with the sole "player" being a laser beam and with the part from "start" to "home" printed on a crystal about the size of a matchbook.

To make sure the laser always "wins," Air Force scientists have stored 40,000 pieces of information, coded as right or wrong moves, on the purple-colored crystal.

The device could replace more complicated memory systems used in some types of equipment. One of the advantages of using a laser beam as a maze runner is the ease involved in switching it off and on merely by interrupting the microscopic beam.

The storage crystal, made of potassium bromide impregnated with hydrogen, is divided into four equal sections. Coded on one of these is the maze which offers four directional choices: left, right, up and down.

Searching for correct information, or "ways out," the laser scans these choices much as a person walks through hallways to get out of a building. Two other sections of the crystal record successful paths; the fourth is a history of all points that have been encountered.

The light source is supplied by two helium neon lasers—one in the red spectrum, the other in the infrared—which are split, then focused over the crystal sections in a parallel arrangement.

Information is put on or taken off the crystal at the rate of one piece of information a thousandth of a second. The technique used is similar to the way some sunglasses change color when exposed to different intensities of light. When a laser in the red spectrum is directed onto the crystal, it bleaches out a small spot. If the information needs to be erased, an infrared beam re-colors the spot purple.

Carson Laboratories of Bristol, Conn., built the device under an Air Force contract with the Avionics Laboratory.

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U.S. Marine Corps Advance Procurement Information Available	21	Apr.
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NORAD Excess ADP Equipment To Be Redistributed	26	Feb.

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Aeronautical Planning Seminar Proceedings Available	19	Aug.
Booklet on O–Ring Compounds Available	25	Aug.
Contractors Training Guide Available	bk	Sep.
DOD Technical Term Glossary Available	18	June
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Military Handbook on Rubber Available	15	Nov.
MTMTS Operations Booklets Available	19	Nov.
NASA Publishes Aerospace Dictionary	bk	Jan.
Navy Guide Available from GPO	7	July
New Directive Covers Unauthorized Disclosures	16	June
New Security Manual Available to Industry	ib	Sep.
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Redesign Doubles Capability of Navy's Submarine Rescue Vehicle	29	Sep.
Reliable Redstone Missile Reactivated for Project Defender	if	Feb.
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Security Classification Guidelines Published for DOD Construction Projects	2	Apr.
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USAERDL Surveys Manufacturers of Physical Security Equipment	if	Aug.
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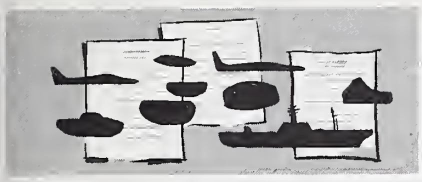

DEFENSE PROCUREMENT

Contracts of $1,000,000 and over awarded during the month of November 1966:

DEFENSE SUPPLY AGENCY

1—**U.S. Rubber Co.**, Washington, Ind. $2,517,577. 242,480 pairs of men's wet weather overalls. Defense Personnel Support Center, Philadelphia, Pa.

—**J. M. Bacheimer**, Frederick, Md. $1,590,457. 948,280 field pack suspenders. Defense Personnel Support Center, Philadelphia, Pa.

2—**Watts Mfg. Co.**, Compton, Calif. $2,520,700. 5,000 large general purpose tents. Defense Personnel Support Center, Philadelphia, Pa.

—**Coastal States Petrochemical Co.**, Houston, Tex. $1,787,919. 16,800,000 gallons of JP–4 jet fuel. Defense Fuel Supply Center, Alexandria, Va.

—**Union Oil Co. of Calif.**, Los Angeles, Calif. $1,335,600. 12,600,000 gallons of JP–4 jet fuel. Defense Fuel Supply Center, Alexandria, Va.

—**Cities Service Oil Co.**, New York City, N.Y. $1,142,326. 10,500,000 gallons of JP–4 jet fuel. Defense Fuel Supply Center, Alexandria, Va.

3—**Pettibone Mulliken Corp.**, Washington, D.C. $2,303,037. 129 six-thousand lb capacity, rough terrain fork lift trucks and 129 sets of technical manuals. Defense General Supply Center, Richmond, Va.

—**Major Clothing Co.**, Bridgeton, N.J. $2,000,250. 45,000 men's wool gabardine overcoats. Defense Personnel Support Center, Philadelphia, Pa.

—**General Cable Corp.**, New York City, N.Y. $2,055,552. 38,400 reels of field wire telephone cable. Defense Industrial Supply Center, Philadelphia, Pa.

—**South Wire Co.**, Carrollton, Ga. $1,596,600. 36,000 reels of field wire telephone cable. Defense Industrial Supply Center, Philadelphia, Pa.

4—**Guy H. James Industries**, Midwest City, Okla. $1,280,000. 1,000,000 men's cotton sateen shirts. Defense Personnel Support Center, Philadelphia, Pa.

9—**Riegel Textile Corp.**, New York City, N.Y. $1,736,848. 1,639,000 yds of wind-resistant cotton oxford cloth. Defense Personnel Support Center, Philadelphia, Pa.

—**C. M. London Co.**, New York City, N.Y. $1,515,100. 1,390,000 yds of wind-resistant cotton oxford cloth. Defense Personnel Support Center, Philadelphia, Pa.

10—**Hart, Schaffner & Marx**, Chicago, Ill. $1,509,480. 42,000 men's polyester and wool tropical coats. Chicago. Defense Personnel Support Center, Philadelphia, Pa.

14—**Ashby Corp.**, St. Louis, Mo. $4,149,000. 300,000 folding canvas cots. Defense General Supply Center, Richmond, Va.

15—**Top Co.**, Boston, Mass. $1,230,200. 770,839 lbs. of wool combings. Defense Personnel Support Center, Philadelphia, Pa.

17—**Collyer Insulated Wire Co.**, Lincoln, R.I. $2,390,425. 6,418,000 feet of shipboard cable. Defense Industrial Supply Center, Philadelphia, Pa.

—**Plastoid Corp.**, Hamburg, N.J. $3,737,653. 13,333,000 feet of shipboard cable. Defense Industrial Supply Center, Philadelphia, Pa.

—**General Cable Corp.**, Havertown, Pa. $2,173,180. 1,123,600 feet of various types of shipboard cable. Defense Industrial Supply Center, Philadelphia, Pa.

—**International Nickel Co.**, Huntington, W. Va. $1,682,975. Various sizes of nickel copper alloy. Defense Industrial Supply Center, Philadelphia, Pa.

18—**J. P. Stevens & Co.**, New York City, N.Y. $2,853,936. 1,662,000 linear yds of cotton and nylon oxford cloth. Defense Personnel Support Center, Philadelphia, Pa.

—The Defense Fuel Supply Center, Alexandria, Va., has awarded the following contracts for JP–5 jet fuel:

Humble Oil & Refining Co., Houston, Tex. $6,872,040. 75,600,000 gals.

Mobil Oil Corp., New York City, N.Y. $5,221,356. 55,084,120 gals.

Gulf Oil Corp., New York City, N.Y. $3,975,300. 42,000,000.

Sun Oil Corp., Philadelphia, Pa. $2,495,505. 25,200,000 gals.

Edgington Oil Refineries, Long Beach, Calif. $1,696,125. 13,750,000 gals.

Golden Eagle Refining Co., Los Angeles, Calif. $1,500,600. 13,000,000 gals.

Marathon Oil Co., New York City, N.Y. $1,464,330. 15,960,000 gals.

Union Oil Co. of Calif., Los Angeles, Calif. $1,261,209. 11,424,000 gals.

21—**Sportwelt Shoe Co.**, Nashua, N.H. $1,455,339. 119,388 pairs of combat boots. Defense Personnel Support Center, Philadelphia, Pa.

—Defense Fuel Supply Center, Alexandria, Va., has awarded the following contracts for petroleum products:

Texaco Export, Inc., New York City, N.Y. $3,733,500. 1,900,000 barrels of Navy Special.

Atlantic Richfield Co., Los Angeles, Calif. $2,310,500. 900,000 barrels of Navy Special.

Texaco, Inc., New York City, N.Y. $1,280,100. 510.000 barrels of Navy Special.

Standard Oil Co. of California, San Francisco, Calif. $1,246,490. 170,000 barrels of Combat Type II and 75,000 barrels of Combat Type I (gasoline).

Edgington Oil Refineries, Inc., Long Beach, Calif. $1,200,500. 45,000 barrels of Navy Special.

Texas City Refining Co., Texas City, Tex. $1,127,500. 300,000 barrels of Diesel Marine.

Golden Eagle Refining Co., Los Angeles, Calif. $1,097,900. 410,000 barrels of Navy Special.

Union Oil Co. of California, Los Angeles, Calif. $1,194,600. 140,000 barrels of Arctic diesel fuel oil and 130,000 barrels of grade DF–1 diesel fuel oil.

American Oil Co., Chicago, Ill. $2,101,580. Fuel oil and gasoline.

Gulf Oil Corp., Houston, Tex. $1,557,378. Fuel oil and gasoline.

Mobil Oil Corp., New York City, N.Y. $1,167,002. Fuel oil and gasoline.

22—The Defense Personnel Support Center, Philadelphia, Pa., has awarded the following contracts for men's black oxford dress shoes:

Genesco, Inc., Nashville, Tenn. $2,816,280. 360,000 pairs.

Cumberland Shoe Corp., Franklin, Tenn. $1,929,600. 240,000 pairs.

Endicott-Johnson Co., Endicott, N.Y. $2,396,680. 286,000 pairs.

J. F. McElwain Co., Nashua, N.H. $2,277,000. 300,000 pairs.

International Shoe Co., St. Louis, Mo. $1,263,291. 148,944 pairs.

—**Milcom Products, Inc.**, Rochester, N.Y. $1,064,023. 692,432 men's belts. Defense Personnel Support Center, Philadelphia, Pa.

—**Wales Mfg. Co.**, Boston, Mass. $1,057,500. 25,000 men's wool gabardine overcoats. Defense Personnel Support Center, Philadelphia, Pa.

23—**Johnson & Johnson**, New Brunswick, N.J. $1,697,366. 1,789,765 packages of surgical sponges. Defense Personnel Support Center, Philadelphia, Pa.

25—The Defense Fuel Supply Center, Alexandria, Va., has awarded the following contracts for JP–4 jet fuel:

Debco Corp., Abilene, Tex. $6,182,823. 59,352,200 gallons.

Bell Oil & Gas Co., Bartlesville, Okla. $3,527,737. 37,555,000 gallons.

Sioux Oil Co., Newcastle, Wyo. $2,386,100. 20,000,000 gallons.

Delta Refining Co., Memphis, Tenn. $2,247,926. 21,652,000 gallons.

Howell Refining Co., San Antonio, Tex. $1,547,218. 14,815,000 gallons.

Tesoro Petroleum Corp., San Antonio, Tex. $1,661,938. 15,300,000 gallons.

Crystal Flash Petroleum Co., Indianapolis, Ind. $1,483,523. 13,570,000 gallons.

Permian Corp., Houston, Tex. $1,463,370. 13,800,000 gallons.

Northwestern Refining Co., St. Paul Park, Minn. $1,155,156. 11,325,500 gallons.

Southland Oil Co., Yazoo City, Mass. $1,114,321. 10,180,000 gallons.

Delta Refining Co., Memphis, Tenn. $1,046,129. 10,328,000 gallons.

Howell Refining Co., San Antonio, Tex. $1,038,253. 10,185,000 gallons.

—**Benton Dairy**, Pensacola, Fla. $1,086,159. Three-month supply of milk and milk products for Fort Benning, Ga. Defense Personnel Support Center, Philadelphia, Pa.

28—**Standard Oil Co. of California**, San Francisco, Calif. $1,174,229. 8,079,960 gallons of RP–1 rocket fuel. Defense Fuel Supply Center, Alexandria, Va.

—**Morris Fishman & Sons, Inc.**, Philadelphia, Pa. $1,561,079. 1,373,998 pounds of scoured carbonized wool. Defense Personnel Support Center, Philadelphia, Pa.

—**J. Schoeneman, Inc.**, Owings Mills, Md. $1,021,500. 30,000 men's tropical wool-polyester coats. Defense Personnel Support Center, Philadelphia, Pa.

29—**Rolane Sportswear**, New York City, N.Y. $1,190,900. 114,300 raincoats. Defense Personnel Support Center, Philadelphia, Pa.

—**Southern Athletic Co.**, Knoxville, Tenn. $1,826,000. 220,000 raincoats. Defense Personnel Support Center, Philadelphia, Pa.

—**Tellico Mfg. Co.**, Tellico Plains, Tenn. $1,073,971. 141,700 raincoats. Defense Personnel Support Center, Philadelphia, Pa.

—**Hunter Outdoor Products**, Long Island City, N.Y. $2,544,600. 9,300 medium size general purpose tents. Defense Personnel Support Center, Philadelphia, Pa.

—**Winfield Mfg. Co.**, Winfield, Ala. $4,828,527. 847,110 pairs of men's cotton, wind-resistant poplin trousers. Defense Personnel Support Center, Philadelphia, Pa.

—**Brownwood Mfg. Co.**, Dallas, Tex. $1,562,500. 250,000 pairs of men's cotton wind-resistant poplin trousers. Defense Personnel Support Center, Philadelphia, Pa.

ARMY

1—**General Instrument Corp., S. W. Sickles Div.**, Chicopee, Mass. $1,505,750. 750-lb bomb fuzes. Chicopee. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Caterpillar Tractor Co.**, Peoria, Ill. $2,313,664. Industrial tractors. Peoria. Army Tank Automotive Center, Warren, Mich.

—**FMC Corp.**, San Jose, Calif. $2,573,314. Self-propelled Hawk guided missile equipment carriers. San Jose. Army Tank Automotive Center, Warren, Mich.

3—**Bell Helicopter Co.**, Fort Worth, Tex. $1,241,009. UH–1 aircraft scissor and sleeve assemblies. Fort Worth. Aviation Materiel Command, St. Louis, Mo.

—**Hughes Tool Co.**, Culver City, Calif. $1,426,000. TH–55A helicopters. Culver City. Army Aviation Materiel Command, St. Louis, Mo.

—**Chamberlain Corp.**, Waterloo, Iowa. $1,178,635. 2.75-inch rocket ammunition metal parts. Waterloo. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Great Lakes Dredge & Dock Co.**, New Orleans, La. $1,396,807. Flood control work on the Mississippi River and its tributaries (Louisiana Project). St. Martin's Parish, La. Engineer Dist., New Orleans, La.

4—**Philco Corp.**, Palo Alto, Calif. $1,000,000. Classified research and development. Palo Alto. Army Electronics Command, Fort Monmouth, N.J.

CONTRACT LEGEND

Contract information is listed in the following sequence: Date—Company—Value—Material or work to be Performed—Location Work Performed—Contracting Agency.

—**TRW, Inc.**, Redondo Beach, Calif. $1,500,000. Classified electronics equipment. Redondo Beach. Army Electronics Command, Fort Monmouth, N.J.

—**AVCO Corp.**, Stratford, Conn. $1,973,611. Increased facilities to permit additional production of T–53 engines and UH–1 aircraft spare and repair parts. Stratford. Army Aviation Materiel Command, St. Louis, Mo.

—**General Electric**, Burlington, Vt. $1,531,628. Armament pod spare parts and ground equipment. Burlington. Army Weapons Command, Rock Island Arsenal, Ill.

7—**General Electric, Missile & Space Div.**, Philadelphia, Pa. $1,273,000. Additional effort on the ARPA Project GLOW research program (an optical instrumentation system). White Sands Missile Range, N.M. and Kwajalein Test Site. Army Missile Command, Huntsville, Ala.

—**Pace Corp.**, Memphis, Tenn. $2,258,485. Illuminating ground signals. Memphis. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Kaiser Jeep Corp.**, Toledo, Ohio. $2,530,284. M606 ¼-ton utility trucks. Toledo. Army Tank Automotive Center, Warren, Mich.

—**Philco Corp., Communication & Electronics Div.**, Philadelphia, Pa. $1,182,254. Expansion of the Integrated Wide Band Communication System training facilities at Fort Monmouth, N.J. Army Electronics Command, Fort Monmouth, N.J.

8—**Page Communications Engineer, Inc.**, Washington, D.C. $6,068,653. Services for the IWCS (Integrated Wide Band Communication System) facilities at Fort Monmouth, N.J. Army Electronics Command, Fort Monmouth, N.J.

—**Gregg, Gibson & Gregg, Inc.**, Leesburg, Fla. $4,191,047. Work on the Cross Florida Barge Canal Project. Putnam and Marion Counties, Fla. Engineer Dist., Jacksonville, Fla.

9—**Wisconsin Motor Corp.**, Milwaukee, Wis. $1,518,390. Engines. Milwaukee. Army Mobility Equipment Command, St. Louis, Mo.

—**RCA**, Burlington, Mass. $9,734,777. Mobile test support equipment for various missile systems. Burlington. Army Missile Command, Huntsville, Ala.

—**Brunswick Corp.**, Marion, Va. $1,290,688. Ordnance. Marion and Sugar Grove, Va. Edgewood Arsenal, Md.

10—**Sperry Rand Corp.**, Phoenix, Ariz. $1,444,000. Gyro magnetic compass sets and ancillary items. Phoenix. Army Electronics Command, Fort Monmouth, N.J.

—**Hanson Machinery Co.**, Tiffin, Ohio. $1,224,871. Truck mounted cranes. Tiffin. Army Mobility Equipment Center, St. Louis, Mo.

—**Philco—Ford Corp.**, Newport Beach, Calif. $9,869,400. 1967 production of data and control sets for the Shillelagh missile system. Lawndale, Calif. Army Missile Command, Huntsville, Ala.

—**Beaver State Contractors**, Eugene, Ore. $2,421,535. Work on the Heise–Roberts Flood Control Project. Rexburg, Ore. Engineer Dist., Walla Walla, Wash.

—**General Motors**, Detroit, Mich. $1,128,092. Starter assemblies for 2½ and 5 ton trucks. Anderson, Ind. Army Tank Automotive Center, Warren, Mich.

—**Honeywell, Inc.**, Hopkins, Minn. $3,322,772. Bomb components. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**AVCO Corp.**, Stratford, Conn. $23,695,425. Modification of T–53–L–13 and T–53–L–11A engines for UH–1 aircraft. Stratford. Army Aviation Materiel Command, St. Louis, Mo.

14—**High Standard Mfg. Corp.**, Hamden, Conn. $2,334,255. M1A1, M2 and M3, 30 cal. carbine parts. Hamden. Procurement Detachment, New York City, N.Y.

—**Philco Corp.**, Philadelphia, Pa. $2,600,000. Expansion of IWCS (Integrated Wide Bank Communications System) in Southeast Asia. Army Electronics Command, Fort Monmouth, N.J.

—**Page Communications Engineers**, Washington, D.C. $9,230,000. Expansion of IWCS in Southeast Asia. Army Electronics Command, Fort Monmouth, N.J.

—**Pathman Construction Co.**, Chicago, Ill. $2,824,727. Construction of a composite dining hall and dormitory at Chanute AFB, Ill. Engineer Dist., Chicago, Ill.

15—**Pace Corp.**, Memphis, Tenn. $1,245,869. Smoke canisters. Camden, Ark. Edgewood Arsenal, Md.

—**Norris Thermador Corp.**, Los Angeles, Calif. $1,361,250. Rehabilitation, repair and installation production equipment for ordnance. Riverbank, Calif. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Amron Corp.**, Waukesha, Wis. $2,115,000. 20mm projectiles. Waukesha. Frankford Arsenal, Pa.

—**United Aircraft, Sikorsky Aircraft Div.**, Stratford, Conn. $1,587,613. Main gear box assemblies for CH–54 aircraft. Stratford. Army Aviation Materiel Command, St. Louis, Mo.

16—**Mohawk Rubber Co.**, Akron, Ohio. $1,766,734. Pneumatic tires for 1½-ton trailers and 2½-ton trucks. Akron. Army Tank Automotive Center, Warren, Mich.

—**Mansfield Tire & Rubber Co.**, Mansfield, Ohio. $1,699,545. Pneumatic tires for 1½-ton trailers and 2½-ton trucks. Mansfield. Army Tank Automotive Center, Warren, Mich.

—**Booze, Allen Applied Research, Inc.**, Chicago, Ill. $1,253,167. Scientific and technical effort in support of the Army Combat Development Institute of Combined Armys and Support. Chicago. Northwest Procurement Agency, Chicago, Ill.

—**Pacific Car & Foundry Co.**, Renton, Wash. $2,435,500. Engineering services for product improvement of M107 and M110 vehicles, and fabrication of test hardware sets. Renton. Northwestern Procurement Agency, Oakland, Calif.

—**Dixie Contractors, Inc.**, Memphis, Tenn. $4,061,240. Work on the Verdigris River Project. Near Catoosa, Okla. Engineer Dist., Tulsa, Okla.

—**United Aircraft**, East Hartford, Conn. $1,186,948. JFTD 12A–4A engines for CH–54A helicopters. East Hartford. Army Aviation Materiel Command, St. Louis, Mo.

—**Boeing Co.**, Morton, Pa. $42,900,000. CH–47B model helicopters, and pre-production planning, procurement and production of long lead time materials for additional CH–47B helicopters. Morton. Army Aviation Materiel Command, St. Louis, Mo.

17—**Chamberlain Corp.**, Waterloo, Iowa. $3,000,000. 105mm cartridge cases. Burlington, N.J. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Sylvania Electric Products, Inc.**, Mountain View, Calif. $3,300,000. Research and development in the field of electronic warfare. Mountain View. Army Electronics Command, Fort Monmouth, N.J.

—**Stewart Warner Corp.**, Lebanon, Ind. $1,113,080. 60mm projectile metal parts. Lebanon. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Bell Aerospace Corp.**, Hurst, Tex. $8,395,859. UH–1E helicopters for the Navy. Hurst. Army Aviation Materiel Command, St. Louis, Mo.

—**Holt Bros.**, Stockton, Calif. $2,269,268. Generator sets. Stockton. Army Mobility Equipment Command, St. Louis, Mo.

18—**General Motors**, Anderson, Ind. $1,071,700. 12 volt storage batteries for vehicles. Anaheim, Calif. and New Brunswick, N.J. Army Tank Automotive Center, Warren, Mich.

—**FMC Corp.**, South Charleston, W. Va. $1,099,300. Armord personnel carrier road wheels. Los Angeles, Calif. and St. Mary's, Ohio. Army Tank Automotive Center, Warren, Mich.

—**AVCO Corp.**, Stratford, Conn. $2,080,000. T–55 engines for CH–47 helicopters. $3,950,000. T–55–L–7 engines for CH–47 helicopters. Stratford. Army Aviation Materiel Command, Warren, Mich.

—**Studebaker Corp.**, Minneapolis, Minn. $4,289,308. Design, fabrication and test of 60 KW generator sets. Minneapolis. Army Research & Development Lab, Fort Belvoir, Va.

—**Philco—Ford Corp.**, Newport Beach, Calif. $1,920,000. Continuation of engineering services in support of the Chaparral Air Defense System. Anaheim, Calif. Army Missile Command, Huntsville, Ala.

21—**Atlantic Research Corp.**, West Hanover, Mass. $1,361,008. Bomb fuzes. West Hanover. Edgewood Arsenal, Md.

—**Norris Thermador Corp.**, Everett, Mass. $6,117,140. 66mm high explosive antitank rocket launchers. Brockton, Mass. New York Procurement Detachment, Army Materiel Command.

—**Firestone Tire & Rubber Co.**, Akron, Ohio. $6,488,746. Combat tank components. Noblesville, Ind. Army Tank Automotive Center, Warren, Mich.

—**Goodyear Tire & Rubber Co.**, Akron, Ohio. $9,358,151. Combat tank components. St. Mary's Ohio. Army Tank Automotive Center, Warren, Mich.

—**General Motors**, Detroit, Mich. $2,424,286. M551 diesel engines. Detroit. Army Tank Automotive Center, Warren, Mich.

22—**Martin-Marietta Corp.**, Orlando, Fla. $1,069,740. Instrumentation modification kits in support of the Pershing weapons system. Orlando. Army Missile Command, Huntsville, Ala.

—**Continental Motors**, Muskegon, Mich. $6,241,900. Engine assemblies and components for V12 diesel engines for various vehicles. Muskegon. Army Tank Automotive Center, Warren, Mich.

—**United Aircraft**, Stratford, Conn. $4,130,405. Gear box assemblies, rudder blades and main rotor blades. Stratford. Army Aviation Materiel Command, St. Louis, Mo.

23—**Brunswick Corp.**, Lincoln, Neb. $1,059,187. Parts for 155mm projectiles. Lincoln. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Albion Malleable Iron Co.**, Albion, Mich. $2,368,800. 2.75-inch rocket metal parts. Albion. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Plymouth Industrial Products**, Sheboygan, Wis. $1,512,800. M105A2 ammunition container assemblies. Plymouth, Mass. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Honeywell, Inc.**, Hopkins, Minn. $2,937,447. Bomb fuzes. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Kisco Co.**, St. Louis, Mo. $1,197,490. 20mm cartridge containers, shipping and storage. St. Louis. Frankford Arsenal, Philadelphia, Pa.

25—**General Dynamics**, Rochester, N.Y. $4,474,817. AN/GRC–106 radio sets. Rochester. Army Electronics Command, Philadelphia, Pa.

—**Olin Mathieson Chemical Corp.**, East Alton, Ill. $3,399,192. Load assemblies for 60mm shells. Marion, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Vipond & Vipond, Inc.**, Hollidaysburg, Pa. $1,494,104. Work on the Union City Reservoir Project. Amity and Waterford, Pa. Engineer Dist., Pittsburgh, Pa.

—**General Dynamics**, San Diego, Calif. $3,418,420. Work on a classified project. Davis-Monthan AFB, Ariz. and San Diego. Army Security Agency, Arlington, Va.

—**Norris Industries**, Vernon, Calif. $3,018,724. Metal parts for 152mm projectiles. Vernon. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Intercontinental Mfg. Co.**, Garland, Tex. $3,092,060. Metal parts for 152mm projectiles. Garland. Ammunition Procurement & Supply Agency, Joliet, Ill.

28—**Canadian Commercial Corp.**, Washington, D.C. $1,334,517. Portable telephone sets. Camp Billton, New Brunswick, Canada. Army Electronics Command, Philadelphia, Pa.

—**Hercules, Inc.**, Wilmington, Del. $11,400,682. Propellant for 2.75-inch rockets. Lawrence, Kan. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Union Carbide Corp.**, New York City, N.Y. $1,132,032. Dry batteries for portable radio sets. Chemway, N.C. Army Electronics Command, Philadelphia, Pa.

29—**Consolidated Box Co.**, Tampa, Fla. $1,914,792. Fibre containers for ammunition. Tampa. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Paper Tubes, Inc.**, Buffalo, N.Y. $1,084,612. Fibre containers for ammunition. Buffalo. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**M. C. Ricciardi Co.**, Alpha, N.J. $2,169,845. Fibre containers for ammunition. Alpha. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**FMC Corp.**, Santa Clara, Calif. $1,612,976. Metal parts for 4.2-inch cartridges. Santa Clara. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Ingraham Co.**, Bristol, Conn. $1,960,000. Metal parts for 4.2-inch mortar rounds. Bristol. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**American Bosch Arma Corp.**, Springfield, Mass. $2,239,487. Fuel pumps for 2½-ton and 5-ton trucks. Springfield. Army Tank Automotive Center, Warren, Mich.

—**Bell Aerospace Corp.**, Fort Worth, Tex. $2,496,392. Drive shaft assemblies for UH-1 helicopters. Fort Worth. Army Aviation Materiel Command, St. Louis, Mo.

—**Western Electric Co.**, Burlington, N.C. $3,049,000. Gyroscopes for Nike Hercules missiles. Burlington. Army Missile Command, Huntsville, Ala.

—**Shaw Contractor & Builders**, Mt. Carmel, Ill. and **D. M. Blake Construction Co.**, Shelbyville, Ill. $1,167,465. Work on the Mt. Carmel Local Flood Protection Project. Mt. Carmel. Engineer Dist., Louisville, Ky.

—**Servel Co.**, Freeport, Ill. $1,765,450. Dry batteries for portable manpacked radio sets. Freeport. Army Electronics Command. Philadelphia, Pa.

—**Chrysler Corp.**, Detroit, Mich. $2,735,121. Engine assemblies with containers for ¾-ton trucks. Marysville, Mich. Army Tank Automotive Center, Warren, Mich.

30—**Bell Aerospace Corp.**, Fort Worth, Tex. (1) $3,669,266. Main rotor hub assemblies for UH–1 helicopters. (2) $5,137,266. Rotor blades, drive mechanism and components for AH–1G helicopters. (3) $1,369,969. Case assemblies, lever assemblies, shaft assemblies and fire wall assemblies for the UH–1 helicopter. $21,795,000. Cobra AH–1G helicopters. (5) $1,865,577. Rotor blades for the UH–1 helicopter. Fort Worth. Army Aviation Materiel Command, St. Louis, Mo.

—**Gar-Let Mfg. Co.**, Philadelphia, Pa. $1,139,464. Cable assemblies for field telephones. Old Force, Pa. Army Electronics Command, Philadelphia, Pa.

—**Electrospace Corp.**, Glen Cove, N.Y. $1,254,730. Central office telephones, manual. Naguabo, Puerto Rico. Army Electronics Command, Philadelphia, Pa.

—**Olin Mathieson Chemical Corp.**, New York City, N.Y. $32,467,993. Propelling charges for artillery ammunition. Charlestown, Ind. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Day & Zimmerman, Inc.**, Philadelphia, Pa. $22,203,465. Artillery projectiles, fuzes and related components and O&MA activities. Texarkana, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Atlas Chemical Industries**, Wilmington, Del. $15,764,868. TNT. Chattanooga, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Mason & Hanger, Silas Mason Co.**, New York City, N.Y. $11,033,262. Warheads and related ammunition components and O&MA activities. Burlington, Iowa. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Hercules, Inc.**, Wilmington, Del. $9,229,957. Miscellaneous propellants and explosives (Nike booster). Radford, Va. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Rohm & Hass Co.**, Philadelphia, Pa. $1,150,000. Propulsion research. Huntsville, Ala. Army Missile Command, Huntsville, Ala.

—**Honeywell, Inc.**, Hopkins, Minn. $1,525,273. Facilities to establish production capabilities for fuzes for the 40mm cartridge. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Chamberlain Corp.**, Waterloo, Iowa. $2,087,400. High explosive warheads for the 2.75-inch rocket, metal parts. Waterloo, Iowa. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Gibbs Mfg. & Research Corp.**, Janesville, Wis. $1,381,380. Fuzes for the 2.75-inch rocket, metal parts. Janesville. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Lehigh, Inc.**, Easton, Pa. $1,695,792. High explosive warheads for the 2.75-inch rocket, metal parts. Easton. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**General Motors**, Anderson, Ind. $3,406,969. Batteries, 12-volt, type 2HM for ¼-ton and ¾-ton trucks. Anaheim, Calif. Army Tank Automotive Center, Warren, Mich.

—**General Motors**, Detroit, Mich. $1,352,692. 6V53 diesel engines with container, 6 cylinder, V type, 210 HP, in support of M113A1 vehicles family. Detroit. Army Tank Automotive Center, Warren, Mich.

—**General Motors**, Hudson, Ohio. $2,568,000. Trucks. Euclid, Ohio. Army Mobility Equipment Command, St. Louis, Mo.

—**Progressive Construction Co.**, Farmville, Va. $1,607,232. Maintenance and rehabilitation of Army Training Center and utilities. Fort Bragg, N.C. Engineer Dist., Savannah, Ga.

—**McDonnell Aircraft**, St. Louis, Mo. $3,000,000. Continued engineering development for the medium anti-tank assault weapons (MAW). Titusville, Fla. Army Missile Command, Huntsville, Ala.

—**Boeing Co.**, Morton, Pa. $2,125,949. Rotor wing blades for— CH–47 aircraft. Morton. Army Aviation Materiel Command, St. Louis, Mo.

—**Minnesota Mining & Mfg. Co.**, Rochester, Minn. $2,349,121. Periscopes and tank periscope mounts for use with the armored reconnaissance airborne assault vehicle (General Heridan). Rochester. Frankford Arsenal, Philadelphia, Pa.

—**Canadian Commercial Corp.**, Ottawa, Canada. $4,000,000. Radio sets and ancillary items. Montreal, Quebec, Canada. Army Electronics Command, Fort Monmouth, N.J.

—**Raytheon Co.**, Norwood, Mass. $2,000,000. Multiplexer and ancillary items. Norwood, Mass. Army Electronics Command, Fort Monmouth, N.J.

—**General Dynamics**, Rochester, N.Y. $1,823,409. Components of shelterized radio sets mounted on a truck. Rochester. Army Electronics Command, Philadelphia, Pa.

—**Machlett Laboratories**, Springdale, Conn. $10,000,000. A classified quantity of image intensifier assembly. Springdale. Army Electronics Command, Fort Monmouth, N.J.

—**Harvey Aluminum, Inc.**, Torrance, Calif. $4,359,800. 20mm high explosive incendiary projectile metal parts and special tooling. Torrance. Frankford Arsenal, Philadelphia, Pa.

NAVY

1—**LTV Aerospace Corp., LTV Vought Aeronautics Div.**, Dallas, Tex. $2,095,000. Services and material to extend the service life and incorporate improvement changes on F-8D aircraft. Dallas. Naval Air Systems Command.

—**Motorola, Inc.**, Scottsdale, Ariz. $1,886,780. Development of a target detecting device for the fusing system of missiles. Scottsdale. Navy Purchasing Office, Los Angeles, Calif.

2—**Williamette Iron & Steel Co.**, Portland, Ore. $1,537,751. Regular overhaul of the landing ship, dock, USS Fort Marion (LSD–22). Portland. Industrial Manager, Thirteenth Naval District.

—**Sanders Associates, Inc.**, Nashua, N.H. $1,000,000. Continued development of an air droppable ASW sonobuoy system. Nashua. Naval Air Systems Command.

—**RCA, David Sarnoff Research Center, Astro Div.**, Princeton, N.J. $2,500,000. Six Navy navigation satellites. Princeton. Special Projects Office.

—**LFE Electronics**, Boston, Mass. $1,649,030. Electronic altimeters. Boston. Naval Air Systems Command.

—**Lockheed Missiles & Space Co.**, Sunnyvale, Calif. $6,054,400. Classified services. Sunnyvale. Special Projects Office.

—**Lockheed Missiles & Space Co.**, Sunnyvale, Calif. $8,684,138. Support of the Polaris missile program. Sunnyvale. Special Projects Office.

3—**North American Aviation**, Columbus, Ohio. $1,765,000. Installment funding for the Condor missile. Columbus. Naval Air Systems Command.

—**North American Aviation, Columbus, Ohio.** $8,989,993. T–2B aircraft and related equipment. Columbus. Naval Air Systems Command.

4—**Lenkurt Electric Co.**, San Carlos, Calif. $1,050,488. Electronic equipment. San Carlos. Navy Purchasing Office, Washington, D.C.

—**Rea Construction Co.**, Charlotte, N.C. $4,292,000. Modernization of Drydock No. 2 at the Naval Shipyard, Charleston, S.C. Southeast Div., Naval Facilities Engineering Command.

7—**Entwistle Mfg. Corp.**, Cranston, R.I. $10,358,890. Catapults and launch spares for launching aircraft. Cranston. Naval Air Engineering Center, Philadelphia, Pa.

8—**General Electric**, Philadelphia, Pa. $2,290,000. Catapult engine power plant assemblies and spare parts kits for launching aircraft. Cincinnati, Ohio. Naval Air Engineering Center, Philadelphia, Pa.

—**American Electronic Laboratories**, Colmar, Pa. $1,994,675. Development of an airborne UHF radio receiver-transmitter pod. Colmar. Naval Air Systems Command.

9—**Bethlehem Steel Corp.**, Terminal Island, Calif. $1,789,648. Topside overhaul of the oiler USS Chemung (AO–30). Terminal Island. Industrial Manager, 11th Naval Dist.

10—**United Aircraft**, East Hartford, Conn. $15,064,529. TF33–P–7 engines for the Air Force. East Hartford. Naval Air Systems Command.

—**McDonnell Aircraft**, St. Louis, Mo. $1,273,400. Spare parts in support of landing gear components for F4J aircraft, St. Louis. Naval Aviation Supply Office, Philadelphia, Pa.

—**Allen M. Campbell Co.**, Tyler, Tex. $5,398,000. Construction of a Force Troops Complex, at the Marine Corps Base, Camp Lejeune, N.C. Atlantic, Div., Naval Facilities Engineering Command.

—**Seatrain Lines**, Edgewater, N.J. $106,000,000. Use of 12 ships in the movement of military cargoes. Military Sea Transportation Service.

14—**Harvell Kilgore Corp.**, Toone, Tenn. $9,866,208. MK24, MOD 3 aircraft parachute flares. Toone. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—**Northrop Corp.**, Asheville, N.C. $14,106,500. MK24, MOD 3 aircraft parachute flares. Asheville. Navy Ships Parts Control Center, Mechanicsburg, Pa.

15—**Sylvania Electronics Systems**, Waltham, Mass. $1,029,750. Airborne receiver transmitter radio sets and related equipment. Waltham. Naval Air Systems Command.

—**McDonnell Aircraft Corp.**, St. Louis, Mo. $45,400,000. F–4E and RF–4C aircraft for the Air Force. St. Louis. Naval Air Systems Command.

—**Plastoid Corp.**, Hamburg, N.J. $3,377,389. Shielded electrical cable for shipboard use. Hamburg. Navy Electronics Supply Office, Great Lakes, Ill.

16—**Bethlehem Steel Corp.**, Bethlehem, Pa. $1,409,621. MK42 gun barrel liners and tubes. Bethlehem. Naval Ordnance Plant, Louisville, Ky.

—**Teledyne, Inc., Sewart Seacraft Div.**, Berwick, La. $1,199,890. Construction of five 85-foot patrol boats. $2,127,397. Construction of 13 65-foot boats for various purposes. Berwick. Naval Ship Systems Command.

—**Collins Radio Co.**, Cedar Rapids, Iowa. $3,909,768. Airborne communication, navigation, identification systems and components. Cedar Rapids. Naval Air Systems Command.

—**ITT Federal Laboratories**, Nutley, N.J. $1,709,950. Airborne receiver-transmitters. Nutley. Naval Air Systems Command.

—**Sparton Corp.**, Jackson, Mich. $6,687,123. Production of sonobuoys. Jackson. Naval Air Systems Command.

—**Pennsylvania State University, Ordnance Research Laboratory**, University Park, Pa. $7,680,000. Work on MK48 torpedoes. University Park. Naval Ordnance Systems Command.

—**Johns Hopkins University, Applied Physics Laboratory**, Silver Spring, Md. $2,023,343. To increase the scope of the contract for the Bumblebee weapon system and associated ordnance tasks. Silver Spring. Naval Ordnance Systems Command.

17—**Gunderson Brothers Engineering Corp.**, Portland, Ore. $3,264,480. Construction of landing craft. Portland. Naval Ship Systems Command.

—**Bendix Corp.**, Teterboro, N.J. $4,321,900. Components of the AN–ASN–39 navigational computer set for F–4J aircraft. Teterboro. Naval Aviation Supply Office, Philadelphia, Pa.

—**Marinette Marine Corp.**, Marinette, Wis. $3,240,000. Construction of landing craft. Marinette. Naval Ship Systems Command.

—**General Precision, Inc.**, Clifton, N.J. $4,004,936. Airborne navigational computer sets. Clifton. Naval Air Systems Command.

—**Magnavox Co.**, Fort Wayne, Ind. $2,163,877. Modification kits for airborne radar sets. Fort Wayne. Naval Air Systems Command.

—**Sundstrand Corp.**, Rockford, Ill. $2,572,345. Constant speed drives and frequency control boxes. Rockford. Naval Air Systems Command.

—**LTV Aerospace Corp.**, Dallas, Tex. $32,000,000. A–7B aircraft. Dallas. Naval Air Systems Command.

18—**Curtiss Wright Corp.**, Wood-Ridge, N.J. $1,176,362. R3350 engine components for A1E and A1H aircraft. Wood-Ridge. Naval Aviation Supply Office, Philadelphia, Pa.

21—**Lear Siegler, Inc.**, Grand Rapids, Mich. $3,528,183. Loft bomb computer systems. Grand Rapids. Naval Air Systems Command.

—**Collins Radio Co.**, Cedar Rapids, Iowa. $5,593,668. Airborne UHF radio sets. Cedar Rapids. Naval Air Systems Command.

—**United Aircraft**, East Hartford, Conn. $3,967,362. J–60–P–6 engines for the Navy. East Hartford. Naval Air Systems Command.

—**Genge Industries**, Port Hueneme, Calif. $6,172,783. Design and design documentation on experimental, developmental and prototype military ordnance equipment. Ridgecrest, Calif. Navy Purchasing Office, Los Angeles, Calif.

—**Greenhut Construction Co.**, Pensacola, Fla. $1,688,968. Construction of a general training building at Keesler AFB, Miss. Gulf Div., Naval Facilities Engineering Command.

22—**Bendix Corp.**, Teterboro, N.J. $1,368,550. Components of the PB20 automatic flight control system used on A–4F aircraft. Teterboro, N.J. and North Hollywood, Calif. Naval Aviation Supply Office, Philadelphia, Pa.

—**Philco-Ford Corp.**, Fort Washington, Pa. $1,353,000. Technical professional services of electronics field engineers. Naval Ship Systems Command.

—**Teledyne Systems Corp.**, Hawthorne, Calif. $4,000,000. Self-contained navigation systems. Hawthorne. Naval Air Systems Command.

25—**Grumman Aircraft Engineering Corp.**, Bethpage, L.I., N.Y. $15,400,000. A–6A aircraft. Bethpage. Naval Air Systems Command.

—**Worthington Corp.**, Harrison, N.J. $1,080,920. Air compressors and related engineering services. Buffalo, N.Y. Naval Ship Systems Command.

28—**Baifield Industries**, Carrollton, Tex. $1,384,735. Manufacture, assembly and checkout of Talos missiles. Carrollton. Naval Ordnance Systems Command.

—**Packard-Bell Electronics Corp.**, Newberry, Park, Calif. $1,509,936. AN/ASM–23 sets used to test radios installed in A–6A and E–2A aircraft. Newberry Park. Naval Aviation Supply Office, Philadelphia, Pa.

29—**Lockheed Missiles & Space Co.**, Sunnyvale, Calif. $12,608,000. Classified research and development work on the Polaris missile system. Sunnyvale. Special Projects Office.

—**North American Aviation**, Anaheim, Calif. $9,844,570. Development, testing, and furnishing of five prototype Ships Inertial Navigation Systems. Anaheim. Naval Ship Systems Command.

—**Norris Industries**, Los Angeles, Calif. $4,820,250. Steel cartridge cases. Los Angeles. Ship Parts Control Center, Mechanicsburg, Pa.

—**Standard Kollsman Industries**, Elmhurst, N.Y. $1,987,153. Fuses and components of 5-inch/38 cal. gun ammunition. Melrose Park, Ill. Naval Ammunition Depot, Crane, Ind.

—**Baifield Industries**, Carrollton, Tex. $1,653,042. Bomb (MK 84) fin assemblies and crates. Carrollton. Ships Parts Control Center, Mechanicsburg, Pa.

—**R. F. Communications**, Rochester, N.Y. $1,557,108. Single-side-band radio equipment for use aboard naval ships. Rochester. Naval Ship Systems Command.

—**Meadow Gold Dairies**, Honolulu, Hawaii. $1,278,719. Milk and dairy products. Naval Supply Center, Pearl Harbor, Hawaii.

—**Intercontinental Mfg. Co.**, Garland, Tex. $6,793,830. Bomb bodies (MK 84). Garland. Ships Parts Control Center, Mechanicsburg, Pa.

30—**Motorola, Inc.**, Chicago, Ill. $1,388,568. Bathythermograph transmitter sets. Chicago. Naval Air Systems Command.

—**Sparton Corp.**, Jackson, Mich. $3,897,761. Sonobuoys. Jackson. Naval Air Systems Command.

—**Magnavox Co.**, Fort Wayne, Ind. $6,967,379. Sonobuoys. Fort Wayne. Naval Air Systems Command.

—**Sanders Associates, Inc.**, Nashua, N.H. $4,895,477. Sonobuoys. Nashua. Naval Air Systems Command.

—**Otis Elevator Co.**, Brooklyn, N.Y. $3,691,980. Sonobuoys. Brooklyn. Naval Air Systems Command.

MARINE CORPS

1—**Goodyear Tire & Rubber Co.**, Akron, Ohio. $1,694,721. Eleven-inch nylon purchase tape to be used in the aircraft arresting gear of the Marine Corps short airfield for tactical support system. Akron. Headquarters, Marine Corps.

14—**Collins Radio Co.**, Cedar Rapids, Iowa. $3,787,690. Procurement of AN/PRC–47 radio sets and related equipment. Cedar Rapids. Headquarters, Marine Corps.

—**Standard Mfg. Co.**, Dallas, Tex. $1,298,623. Production of air-launched weapons loaders. Dallas. Headquarters, Marine Corps.

28—**FMC Corp.**, San Jose, Calif. $1,272,562. Production of additional road wheel assemblies for amphibian tractors. San Jose. Headquarters, Marine Corps.

AIR FORCE

1—**Continental Aviation & Engineering Corp.**, Detroit, Mich. $1,276,560. Production of J–69 engines for drone target aircraft. Toledo, Ohio. Aeronautical Systems Div., (AFSC), Wright-Patterson, AFB, Ohio.

—**AiResearch Mfg. Co.**, Phoenix, Ariz. $1,250,800. Production of gas turbine compressors. Phoenix. Sacramento Air Materiel Area, (AFLC), McClelland AFB, Calif.

—**Philco Corp.**, Fort Washington, Pa. $1,150,000. Operation and maintenance of the precision measurement laboratory at the Western Test Range. Vandenberg AFB Calif. Air Force Western Test Range, Vandenberg AFB, Calif.

—**General Motors**, Indianapolis, Ind. $3,313,004. Production of turbine blades for T–56 engines. Indianapolis. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

2—**Hughes Aircraft**, Culver City, Calif. $2,377,476. Engineering and production of components F–106 fire control system. Culver City. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.

—**Fairchild Hiller Corp.**, Farmingdale, N.Y. $5,866,960. Engineering and production of modification kits and spare parts for F–105 aircraft. Farmingdale. Sacramento Air Material Area, (AFLC), McClellan AFB, Calif.

—**Bendix Corp.**, South Bend, Ind. $1,365,227. Overhaul and modification of J–57 engine components. South Bend. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.

3—**TRW, Inc.**, Redondo Beach, Calif. $2,869,000. Work on a space program. Redondo Beach. Space Systems Div., (AFSC), Los Angeles, Calif.

—**North American Aviation**, Anaheim, Calif. $1,094,462. Procurement of spare parts for the Minuteman weapon system. Anaheim Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.

—**Litton Systems**, Woodland Hills, Calif. $4,561,493. Production of components for the avionics systems on the F–4 and RF–4 aircraft. Woodland Hills. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**General Dynamics**, Fort Worth, Tex. $1,450,000. Studies relating to an advanced manned strategic aircraft. Fort Worth. Aernautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**General Electric**, West Lynn, Mass. $2,915,600. Production of T–58 engines for UH–1 and CH–3 helicopters. West Lynn. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**Hallicrafters Co.**, Chicago, Ill. $1,174,280. Airborne electronic countermeasure systems. Chicago. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

4—**General Electric**, West Lynn, Mass. $3,212,000. Production of J–85 engines for F–5 aircraft. West Lynn. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**Boeing Co.**, Wichita, Kan. $2,546,159. Fatigue testing of B–52 aircraft. Wichita. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

7—**Fairchild Hiller Corp.**, Hagerstown, Md. $6,694,838. Modification of C–123 aircraft. Hagerstown. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

—**Federal Electric Corp.**, Richland, Wash. $2,862,064. Generator sets. Richland. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif.

—**Lear Siegler, Inc.**, Santa Monica, Calif. $1,142,604. Production of components for aircraft flight control systems. Santa Monica. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

8—**Teletype Corp.**, Skokie, Ill. $1,876,235. Production of teletype machines. Skokie. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

—**Bendix Corp.**, Teterboro, N.J. $4,730,768. Production of spare parts for C–141 navigation systems. Teterboro. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

9—**Boeing Co.**, Morton, Pa. $1,000,000 . Research and development of helicopter rotor blades. Morton. Systems Engineering Group, Research & Technology Div., (AFSC), Wright-Patterson AFB, Ohio.

—**Lear Siegler, Inc.**, Grand Rapids, Mich. $2,004,372. Gyroscope instruments for aircraft. Grand Rapids. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**Mitre Corp.**, Bedford, Mass. $3,493,832. Research and development in the field of command and control systems. Bedford. Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass.

10—**North American Aviation**, Anaheim, Calif. $50,000,000. Production of guidance and control systems for Minuteman II missile systems. Anaheim. Ballistic Systems Div., (AFSC), Norton AFB, Calif.

—**Lockheed Aircraft**, Lake Charles, La. $3,670,866. Modification inspection and repair of F–101 aircraft. Lake Charles. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.

—**Canoga Electronics Corp.**, Torrance, Calif. $2,967,846. Production of closed circuit television weather briefing systems. Torrance. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

—**Continental Aviation & Engineering Corp.**, Detroit, Mich. $3,446,712. Production of J–69 engines for T–37 aircraft. Toledo, Ohio. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**North American Aviation**, Los Angeles, Calif. $1,642,000. Studies applicable to an advanced manned strategic aircraft. Los Angeles. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**Boeing Co.**, Renton, Wash. $1,043,500. Studies applicable to an advanced manned strategic aircraft. Renton. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**General Motors**, Indianapolis, Ind. $3,637,574. Aircraft engine development work. Indianapolis. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

16—**General Motors**, Indianapolis, Ind. $7,452,000. Production of T–56 turboprop engines, and related equipment. Indianapolis. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**Rand Corp.**, Santa Monica, Calif. $6,000,000. Studies and research on aerospace power. Santa Monica. Air Force Office of Scientific Research.

17—**Emerson Electric Co.**, St. Louis, Mo. $1,050,000. Development of an advanced aircraft radar antenna system. St. Louis. Systems Engineering Group, Research & Technology Div., (AFSC), Wright-Patterson AFB, Ohio.

—**U.S. Rubber Co.**, Detroit, Mich. $2,070,276. Production of tires for F–100, F–102 and F–106 aircraft. Detroit. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.

18—**North American Aviation**, Canoga Park, Calif. $1,994,370. Production of Thor space booster rocket engines. Neosho, Mo and Canoga Park. Space Systems Div., (AFSC), Los Angeles, Calif.

—**General Electric**, West Lynn, Mass. $6,504,000. Production of J–85 engines for F5 and C–123 aircraft. West Lynn. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**RCA**, Moorestown, N.J. $1,019,000. Production of digital range tracking systems. Moorestown. Air Force Eastern Test Range, Patrick AFB, Fla.

21—**Sylvania Electronic Products**, Williamsville, N.Y. $2,600,000. Production of airborne electronic equipment. Williamsville. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**General Electric**, Utica, N.Y. $3,899,105. Production of airborn electronic countermeasure equipment. Utica. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

22—**Motorola, Inc.**, Scottsdale. Ariz. $1,425,000. Production of fuzes and related equipment for aircraft ordnance. Scottsdale. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**Boeing Co.**, Seattle, Wash. $3,076,000. Modernization of Minuteman Wing I. Great Falls, Mont. Ballistics Systems Div., (AFSC), Norton AFB, Calif.

23—**Douglas Aircraft**, Tulsa, Okla. $3,951,405. Modification and maintenance of B–52 aircraft. Tulsa. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

—**Bendix Corp.**, South Bend, Ind. $1,293,575. Production of aircraft brake assemblies. South Bend. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.

—**Boeing Co.**, Wichita, Kan. $4,438,833. Modification and maintenance of B–52 aircraft. Wichita. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

28—**General Dynamics**, San Diego, Calif. $1,100,000. Repair and modification of Atlas launch vehicles. San Diego. Ballistic Systems Div., (AFSC), Norton AFB, Calif.

—United Aircraft, East Hartford, Conn. $1,044,060. Work on the supersonic combustion ramjet program. East Hartford. Systems Engineering Group, Research & Technology Div., (AFSC), Wright-Patterson AFB, Ohio.

—Lockheed Aircraft, Marietta, Ga. $1,425,000. Modification of the integrated flight control for the XV–4A aircraft. Marietta. Systems Engineering Group, Research & Technology Div., (AFSC), Wright-Patterson AFB, Ohio.

—ITT, Nutley, N.J. $23,085,137. Production of airborn Loran navigation sets and related equipment, and for field engineering services. Nutley. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

29—Cornell Aeronautical Laboratory, Buffalo, N.Y. $1,748,600. Analysis and evaluation of penetration aids effectiveness. Buffalo. Systems Engineering Group, Research & Technology Div., (AFSC), Wright-Patterson AFB, Ohio.

—Boeing Co., Wichita, Kan. $11,327,395. Modification of B–52 aircraft. Wichita. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

—Bendix Corp., Teterboro, N.J. $1,337,414. Production of aircraft flight instruments. Teterboro. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—Applied Technology, Inc., Palo Alto, Calif. $6,620,719. Production of airborne electronic equipment for fighter and reconnaissance aircraft. Palo Alto. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

30—Northrop Corp., Hawthorne, Calif. $5,278,082. Production of long lead time equipment for F–5 aircraft. Hawthorne. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—North American Aviation, Anaheim, Cailf. $2,000,000. Maintenance and modification of Minuteman missile guidance and control equipment. Anaheim. Ballistic Systems Div., (AFSC), Norton AFB, Calif.

—Hughes Aircraft Co., Culver City, Calif. $1,161,191. Modification of Falcon air-to-air missiles. Culver City. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

U.S.-FRG Select Firms To Develop V/TOL and V/STOL Aircraft

The United States and the Federal Republic of Germany (FRG) have selected two firms to conduct the prototype definition phase in the joint development of Vertical Take-Off Landing/Short Take-Off Landing (VTOL/STOL) fighter aircraft, which could be procured for test and evaluation.

Republic Aviation, a division of Fairchild Hiller, Farmingdale, Long Island, N.Y., and the German firm Entwicklungstring-SUD of Munich, Germany, will perform the work under the direction of the System Program Office, jointly manned by U.S. and FRG personnel.

The decision to procure a test quantity of the prototype aircraft will await the completion of the studies expected late next year.

Lightning-Proof Fuel Cap Developed by U.S. Air Force

A lightning-proof aircraft fuel filler cap has been developed for the Air Force by the Systems Engineering Group at Wright-Patterson AFB, Ohio.

The new cap was tested with man-made lightning at the Lightning and Transients Research Institute, Minneapolis, Minn. The tests proved that the filler cap will not cause sparks inside the aircraft fuel tank when the cap is struck by lightning.

Because of the excellent path it provides to the external surfaces of the aircraft wing, the cap is not damaged by high electrical currents.

Special provisions have been made to seal the cap against high transient pressures resulting from a lightning strike. In addition, the parts of the cap inside the fuel tank are nonmetallic. These design features are essential in preventing arcing inside the fuel tank.

The new fuel filler cap is interchangeable with many of the caps now used on aircraft. It will provide an added degree of safety to both military and civilian aircraft fuel systems.

Maverick Contract Definition Phase Contractors Selected

The Air Force has selected the Hughes Aircraft Co. of Culver City, Calif. and North American Aviation of Columbus, Ohio, to proceed with the contract definition phase of the Maverick (AGM–65A) air-to-ground missile program.

Contracts valued at about $3 million will be awarded to both companies for the work. The purpose of the contract definition phase is to verify the preliminary Maverick design and engineering, and to provide information necessary to award a definitive contract for development and production.

The Maverick is planned as a nonnuclear air-to-ground missile for use with the F–111A, A–7D and F–4 aircraft.

The Maverick program is managed by the Aeronautical Systems Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.

DEFENSE PRIME CONTRACT AWARDS TO SMALL BUSINESS

(Amounts in Thousands)

	July-Sept. 1966	July-Sept. 1965
Procurement from All Firms	$10,564,313	$7,495,407
Procurement from Small Business Firms	2,042,902	1,474,261
Percent Small Business	19.3	19.7

Zero Defects Awards Program Included in Amended Instruction

A Zero Defects Awards Program for contractors of the Defense Department has been incorporated into DOD Instruction 4155.12, "DOD Zero Defects Program."

The program consists of Participation, Achievement and Craftsmanship Awards. These awards are designed to recognize those contractors who participate in the DOD-sponsored Zero Defects program and demonstrate significant progress and achievements in meeting contractor-established performance goals.

Guidelines and criteria for meeting eligibility requirements for receiving the three levels of Zero Defects awards are detailed in the inclosure to the amended instruction.

Civil Works Projects

(Continued from Page 24)

chloride pollution; expansion of water quality monitoring program; hydrological investigations. $46,400,000.

WASHINGTON

Skagit River. (FC) Channel, levee and recreation improvements. $5,804,000.

WEST VIRGINIA

West Fork River. (MP) Stonewall Jackson Reservoir. $34,500,000.

NAVIGATION SURVEYS

Great Lakes (particularly Lake Ontario and Lake Erie).

Mexico Beach, Fla.

FLOOD CONTROL SURVEYS

Watershed and streams of Alaska, Hawaii, Puerto Rico, the Virgin Islands, and the Mississippi River below Cairo, Ill.

Watersheds and streams draining into: Great Lakes and St. Lawrence River (within the United States), and the Gulf of Mexico (along Texas coastline excluding the Rio Grande River).

Arkansas, White and Red Rivers and tributaries (excluding their drainage lying in the alluvial valley of the Mississippi River).

Cibolo Creek, Presido, Tex.

Great South Bay, N.Y.

Pacific Palisades Area at and in the vicinity of Los Angeles County, Calif.

Souris River and Red River of the north and tributaries (including adjacent streams in Minnesota draining into Canada).

Spring Valley Creek, Sweetwater River, Calif.

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Celestial-Inertial Lab Planned for Holloman AFB in 1967

A super-precision test laboratory that will resemble a planetarium is in the planning stages at the Air Force Systems Command's Missile Development Center, Holloman AFB, N. M. With construction requested for FY 1967, the domed structure is intended to house the most advanced celestial-inertial guidance test equipment available for evaluating the guidance systems of our nation's military vehicles.

"Future military guidance systems will require automatic methods for identifying and tracking stars, planets, satellites, even the earth itself, with extreme accuracy," said Edgar B. Godley, chief of the Missile Development Center's Celestial-Inertial Branch, in explaining the need for this new test facility. "Likewise our measurements must be an order of magnitude more precise than the quantity we are evaluating," he continued.

The concept for future advanced evaluation was developed over the last six years by the center's Directorate of Guidance Test. To this planning has been added the results of a study made by the AC Electronics Division of General Motors Corp. for the main piece of test equipment which will be a polar-axis celestial simulator.

The polar-axis fixture, on which an entire celestial-inertial guidance system may be mounted for test purposes, will be driven "at minus earth rate" to maintain the fixed spatial position necessary for such tests. Surrounding this tracker platform, a domed structure will carry as many as five or six star simulators, as well as sun, moon and and planet simulators, for the purpose of subjecting the guidance system to tests free of either seismic or man-made disturbances.

The building, partly above ground and partly underground, will contain a natural celestial observatory as well as super-clean laboratories built around separate stable pads for this isolating effect. By the basic expedient of isolating the stable pad from seisms of all kinds and by driving the platform at minus earth rate exactly, the celestial-inertial system under test will be equivalently in free space, except for gravity.

The completion of the entire test complex, including laboratories for precise gyroscope and accelerometer tests, is planned for the fiscal year period 1969–1970.

USAF Awards SCRAMJET Contracts

The U. S. Air Force has awarded three study contracts for a high-altitude, hypersonic, SCRAMJET-powered cruise vehicle. Three contracts, totaling $900,000, were awarded to Lockheed-California Co., North American Aviation, Inc., and McDonnell Aircraft Corp.

SCRAMJET, an acronym for Supersonic Combustion Ramjet, is a revolutionary power plant being developed and tested for the Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio. The ramjet engine uses high speed air as a compressor and burns high-energy fuel to boost its speed into hypersonic ranges.

Under the study contracts, the contractors will develop vehicle design concepts and identify military missions to be performed by a SCRAMJET-powered vehicle. Phases of the 12-month contracts also include application studies to match vehicle and mission, determination of mission operational characteristics, and conduct of vehicle parametric studies to evaluate alternate designs for a hypersonic vehicle.

The work will be performed under the direction of the Deputy for Advanced Systems Planning, AFSC Aeronautical Systems Division, Wright-Patterson AFB. Capt. Richard J. Menna is project manager for the vehicle.